11-6625-299-15

TM 11-6625-299-15

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT FIELD AND DEPOT MAINTENANCE MANUAL

SIGNAL GENERATORS
AN/URM-64 AND (NSN 6625-00-283-9621) AND AN/URM-64A (NSN 6625-00-553-0433)

This reprint includes all changes in effect at the time of publication - Changes 2 and 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
27 JANUARY 1959

READEX FICHE best copy available

D101.11:

TM 11-6625-299-15
Change No. 2

TECHNICAL MANUAL

Operator, Organizational, Field, and Depot Maintenance
SIGNAL GENERATORS AN/URM-64 AND AN/URM-64A

TM 11-6625-299-15
CHANGES No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. *6 September 1963*

TM 11-6625-299-15, 27 January 1959 is changed as follows:

Page 1-1. Add paragraphs 1.1 and 1.2 after paragraph 1.

1.1. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment. DA Pam 310-4 is a current index of technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work Orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest Changes to and revisions of each equipment publication.

1.2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended changes to DA techniman manual parts lists or supply manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N. J. One information copy will be furnished to the individual's immediate supervisor (e.g., officer, noncommissioned officer, supervisor, etc).

Page 4-1. Delete paragraphs 1 and 2 and substitute:

1. Scope of Maintenance

The maintenance duties assigned to the operator of Signal Generators AN/URM-64 and AN/URM-64A are listed below together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require tools or test equipment other than those issued with the signal generator.

a. Daily preventive maintenance checks and services (par. 2.2).

b. Weekly preventive maintenance checks and services (par. 2.3).

c. Cleaning (par. 2.4).

d. Monthly preventive maintenance checks and services (par. 2,6).

e. Touchup painting (par. 2.7).

2. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 2.2 through 2.6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (pars. 2.2.2.3 and 2.6) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are. The *references* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38–750.

Add paragraphs 2.1 through 2.7 after paragraph 2.

2.1. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of Signal Generators AN/URM-64 and AN/URM-64A are required daily, weekly, and monthly. Paragraphs 2.1, 2.2, and 2.6 specify the items to be checked and serviced. In addition to the routine daily, weekly, and monthly checks and services, the equipment should be rechecked and serviced immediately before going on a mission and as soon after completion of the mission as possible.

2.2. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Completeness	Be sure the equipment is complete	Appx. III.
2	Cleaning	Remove dirt and moisture from exposed surfaces of the case and housing.	Par. 2.4.
3	Meter window	Inspect the meter window for broken glass.	
4	Pilot light	During operation (item 7 below), inspect for a burned-out pilot light.	
5	Meter movement	During operation (item 7 below), check for sticking meter movement.	
6	Knobs, dials, and switches	While making the operating check (item 7 below), observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding.	
7	Operation	During operation, be alert for any unusual performance or condition.	

2.3. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Cords and cables	Inspect cords and cables for cuts, cracks, strain, fraying, or deterioration.	
2	Handle and latches	Hand-check for looseness of handle and latches.	
3	Preservation	Inspect exposed metal surfaces for rust and corrosion. If present, refer to paragraph 2.7.	

2.4. Cleaning

Inspect the exterior of the signal generator. The exterior surfaces should be free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

***Warning:* Cleaning Compound is flammable and it fumes are toxic. Provide adequate ventilation. *Do not* use near a flame.**

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with Cleaning Compound (Federal Stock No. 7930–395–9542).

c. Remove dust or dirt from plugs and jacks with a brush.

***Caution:* Do not press on the meter face (glass) when cleaning; the meter may be damaged.**

d. Clean the front panels, meters, and control knobs, use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning.

2.5. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and service chart (par. 2.6) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

2.6. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Pluckout items	Inspect seating of readily accessible items of a pluckout nature such as fuses, connectors, tubes, and lamps. Do not remove, rock, or twist to inspect. Use only direct pressure to insure item is fully seated.	
2	Resistors and capacitors	Inspect resistors and capacitors for cracks, blistering, or other detrimental defects.	
3	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310–4.
4	Modifications	Check DA Pamphlet 310–4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	DA Pam 310–4 and TM 38–750.

2.7. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9–213.

Page 6–1. Delete section VI (except paragraph 7 and figures 6–1 and 6–2).

Page 7–38. Insert Appendix I after page 7–38.

APPENDIX I

REFERENCES

Following is a list of applicable publications available to the operator and repairman of Signal Generators AN/URM-64 and AN/URM-64A.

DA Pam 310-4	Index of Technical Manuals, Technical Bullettins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 9-218	Painting Instructions for Field Use.
TM 11-6625-299-15	Operator, Organizational, Field and Depot Maintenance Manual: Generators AN/URM-64 and AN/URM-64A.
TM 11-6625-299-20P	Organizational Maintenance Repair Parts and Special Tools List for Signal Generators AN/URM-64 and AN/URM-64A.
TM 11-6625-299-35P	Field and Depot Maintenance Repair Parts and Special Tools List for Signal Generators AN/URM-64 and AN/URM-64A.
TM 38-750	The Army Equipment Record System and Procedures.

Change "APPENDIX I" (as added by C 1) to APPENDIX II.

Change "APPENDIX II" (as added by C 1) to APPENDIX III).

BY ORDER OF THE SECRETARY OF THE ARMY:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-32, Section II (Unclas) requirements for Nike-Hercules, Improved Nike-Hercules, Target Missile, Nike-Ajax and Hawk — TM — Power (Sig).

Changes in force: C2 and C3

TM 11-6625-299-15
***C 3**

Change
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *18 May 1982*

Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual

SIGNAL GENERATORS AN/URM-64 (NSN 6625-00-283-9621) AND AN/URM-64A (NSN 6625-00-553-0433)

TM 11-66625-299-15, 27 January 1959, is changed as follows: Change the title of the manual as shown above.

Page 1-1. Paragraphs 1.1 and 1.2 are superseded as follows:

1.1. Index of Technical Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1.2. Maintenance Forms, Records, and Reports.

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (Army).

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C/DLAR 4500.15.

Paragraphs 1.3 through 1.6 are added after paragraph 1.2.

1.3. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command, ATTN: DRESEL-ME-MQ, Fort Monmouth, New Jersey 07703. In either case, a reply will be furnished direct to you.

1.4. Reporting Equipment Improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

1.5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Original packing case may be used when repacking equipment for shipment for repair.

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*This changes supersedes C1, 23 May 1962 of TM 11-6625-299-15, 27 January 1959.

1.6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

Page 4-1. Paragraphs 1 and 2 are superseded as follows:

1. Scope of Maintenance

The maintenance duties assigned to the operator of Signal Generators AN/URM-64 and AN/URM-64A are listed below, together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require tools or test equipment other than those issued with the signal generator.

a. Daily, weekly, and monthly preventive maintenance checks and services (para 2.2).

b. Cleaning (para 2.3).

c. Touchup painting (para 2.4).

2. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable. The procedures given in paragraphs 2.1 through 2.4 cover routine systematic care and cleaning essential to proper upkeep and operation of Signal Generators AN/URM-64 and AN/URM-64A. The Preventive Maintenance Checks and Services Chart (para 2.2) outlines functions to be performed at specific intervals. These checks and services are to maintain Army equipment in a combat-ready condition; that is, in good general (physical) condition and in good operating condition. To assist maintenance personnel in maintaining combat readiness, the chart indicates what to check, how to check, and what the normal conditions are. If the defect cannot be remedied by performing the corrective actions listed in the troubleshooting procedures (table 4-2), higher category maintenance repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

Paragraphs 2.1 through 2.7 are superseded as follows:

2.1. Preventive Maintenance Checks and Services

Preventive maintenance checks and services (PMCS) for the AN/URM-64 and AN/URM-64A are performed at daily, weekly, and monthly intervals.

a. PMCS Chart. The PMCS chart specifies the checks and services that must be done at the interval specified.

b. Deficiencies or Shortcomings. All deficiencies or shortcomings will be recorded in accordance with TM 38-750.

c. Column Entries used in PMCS Chart. Each of the column entries used in the PMCS chart is explained below:

(1) The item number lists the checks and services to be performed in order. The column is also used as a source of the item numbers to be listed on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

(2) The interval column indicates when each PMCS should be performed.

(3) The item to be inspected indentifies which part of the set is to be inspected.

(4) The procedures column indicates the inspection procedure to follow.

d. Routine Checks. Routine checks such as cleaning, checking for frayed cables, and tightening handle and latches are not listed as PMCS. These checks should be done anytime they are necessary.

NOTE

> **The following procedures are performed after the signal generator is properly shut down. Preventive maintenance is done with the power turned OFF. If at any point during the procedures an operation cannot be performed, do not proceed to the next step until the problem has been corrected. If you cannot perform the required maintenance or corrective action, please notify higher level maintenace immediately.**

2.2. Organizational Preventive Maintenance Checks and Services

D-Daily W-Weekly M-Monthly

Item No.	Interval D	Interval W	Interval M	Item to be inspected	Procedures
1	●			Completeness	Be sure equipment is complete.
2	●			Meter window	Inspect the meter window for broken glass.
3	●			Knobs, dials, and switches	Observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding.
4		●		Cords and cables	Inspect cords and cables for cuts, cracks, strain, fraying, or deterioration.
5			●	Pluckout items	Inspect seating of readily accessible items of a pluckout nature such as fuses, connectors, tubes, and lamps. Do not remove, rock, or twist to inspect. Use only direct pressure to insure item is fully seated.
6			●	Resistors and capacitors	Inspect resistors and capacitors for cracks, blistering, or other detrimental defects.
7			●	Modifications	Check DA Pamphlet 310-4 to determine if new applicable MWO's have been published. ALL URGENT MWO's must be applied immediately. ALL NORMAL MWO's must be scheduled.

2.3. Cleaning

Inspect the exterior of the equipment to be sure the exterior surfaces are free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with trichlorotrifluoroethane.

c. Remove dust or dirt from the dc output cable battery connector with a brush.

CAUTION

Do not press on the meter faces (glasses) when cleaning; meters may become damaged.

d. Clean the front panel and the meters with a soft clean cloth. If necessary, dampen the cloth with water; mild soap may be used for more effective cleaning.

2.4. Touchup Painting Instructions

a. *Rustproofing*. When the finish on the signal generator has become badly scarred or damaged, rust and corrosion can be prevented by touching up the bare sufaces. Use No. 000 sandpaper to clean the surfaces down to bare metal. Obtain a bright smooth finish.

b. *Painting*. Remove rust and corrosion from the metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 43-0118.

Page 4-13. Table 4-4. Add the following to column 1, line 16, after V-121, pin No. 2: pin No. 9*

Add the following to column 2, line 16, after V-121, pin No. 7: pin No. 4 and 5*

Add the following at the end of table 4-4: *For tube type 5814A only.

Pages 4-37 through 4-42. Table 4-5 is superseded as follows:

TABLE 4-5. VOLTAGE MEASUREMENTS

NOTES

1. All voltage measurements are made

with SELECTOR SWITCH in NEG SYNC position.

2. All voltages are dc, unless otherwise indicated, tolerance ± 10%. They are effective for all equipments unless otherwise specified. (Refer to 7 below).

3. All measurements are made with respect to -325 volt supply line (any red lead), unless followed by asterisk (*); such annotated values are measured with respect to chassis.

4. Multimeter TS-352/U is used for 20,000 ohms-per-volt measurements. Alternates are Simpson Model 260, Navy Model OE, or Weston Model 790.

5. Multimeter TS-297/U is used for 1000 ohms-per-volt measurements. Alternates are Simpson Model 443 or Weston Model 663.

6. Nominal primary power input, when measured with Voltmeter IS-185, is 115 volts, 50 to 1600 cps, single phase.

7. Voltage value in parentheses applies to equipments of Contracts N383s-5019A, N383s-45741, and N383s-67816; other value is for equipments of Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651, and the TS-419A/U equipments.

8. In Contract N383( )-89388A equipment, tube type 7F8W is replaced by type 5814A. The tube type column of the table lists the corresponding tube terminal numbers of both types.

TABLE 4-5. VOLTAGE MEASUREMENTS—Continued

TEST POINT			20,000 ohms-per-volt-meter		1,000 ohms-per-volt meter	
Reference symbol	Tube type terminal number		Meter scale	Voltage	Meter scale	Voltage
V-101	JAN-7F8W:	JAN-5814A				
	1	7	1000	80	-	-
	2	9	10	6.3 ac	10	6.3 ac
	3	6	250	-80*	1000	-80*
	4	8	250	80	1000	80
	5	3	1000	280	1000	280
	6	1	250	0*	250	0*
	7	4,5	250	0	250	0
	8	2	1000	275	-	
V-102	JAN-7F8W:	JAN-5814A:				
	1	7	1000	100	1000	100
	2	9	10	6.3 ac	10	6.3 ac
	3	6	250	-185*	1000	-185*
	4	8	250	100	1000	100
	5	3	250	100	1000	100
	6	1	250	0*	250	0*
	7	4,5	250	0	250	0
	8	2	250	85	1000	80
V-103	JAN-7F8W:	JAN-5814A:				
	1	7	250	0*	250	0*
	2	9	10	6.3 ac*	10	6.3 ac*
	3	6	250	0*	250	0*
	4	8	250	0*	250	0*
	5	3	250	0*	250	0*
	6	1	250	0*	250	0*
	7	4,5	250	0*	250	0*

TABLE 4-5. VOLTAGE MEASUREMENTS—Continued

TEST POINT			20,000 ohms-per-volt-meter		1,000 ohms-per-volt meter	
Reference symbol	Tube type terminal number		Meter scale	Voltage	Meter scale	Voltage
V-104	JAN-7F8W:	JAN-5814A:				
	1	7	50	19	-	-
	2	9	10	6.3 ac	10	6.3 ac
	3	6	250	-170* (-145*) (Note 7)	250	-170*(-145*) (Note 7)
	4	8	50	17 (19) (Note 7)	100	17 (19) (Note 7)
	5	3	50	17 (19) (Note 7)	100	17 (19) (Note 7)
	6	1	250	0*	250	0*
	7	4,5	250	0	250	0
	8	2	250	0	250	0
V-105		JAN-6V6GTY:				
		1	-	-	-	-
		2	10	6.3 ac	10	6.3 ac
		3	250	0*	250	0*
		4	250	0*	250	0*
		5	250	0	250	0
		6	-	-	-	-
		7	250	0	250	0
		8	250	50	250	50
V-106		JAN-6V6GTY:				
		1	-	-	-	-
		2	10	6.3 ac	10	6.3 ac
		3	250	0*	250	0*
		4	250	0* (58) (Note 7)	250	0* (58) (Note 7)
		5	1000	-60 (-21) (Note 7)	250	-45 (-19) (Note 7)
		6	(250)	(58) (Note 7)	250	(58) (Note 7)
		7	250	0	250	0
		8	250	0	250	0
V-107		JAN-6V6GTY:				
		1	-	-	-	-
		2	10	6.3 ac	10	6.3 ac
		3	250	-100*	250	-100*
		4	250	90	250	85
		5	250	0	250	0
		6	250	90	250	85
		7	250	0	250	0
		8	250	0	250	0
V-108		JAN-6V6GTY:				
		1	-	-	-	-
		2	10	6.3 ac	10	6.3 ac
		3	250	0*	250	0*
		4	250	0*	250	0*
		5	1000	-60	1000	-50
		6	-	-	-	-
		7	250	0	250	0
		8	250	0	250	0

TABLE 4-5. VOLTAGE MEASUREMENTS—Continued

TEST POINT			20,000 ohms-per-volt-meter		1,000 ohms-per-volt meter	
Reference symbol	Tube type terminal number		Meter scale	Voltage	Meter scale	Voltage
V-109		JAN-6V6GTY:				
		1	-	-	-	-
		2	10	6.3 ac	10	6.3 ac
		3	250	0*	250	0*
		4	250	0*	250	0*
		5	250	0	250	0
		6	250	0	250	0
		7	250	0	250	0
		8	50	37.5	50	36
V-110	JAN-7F8W:	JAN-5814A:				
	1	7	1000	-300	1000	-300
	2	9	10	6.3 ac	10	6.3 ac
	3	6	1000	-300	1000	-300
	4	8	250	0	250	0
	5	3	250	0	250	0
	6	1	1000	-300	1000	-300
	7	4,5	250	0	250	0
	8	2	1000	-300	1000	-300
V-111		JAN-6BM6A:				
		1	1000	-300	1000	-300
		2	250	0	250	0
		3	250	0	250	0
		4	10	6.3 ac	10	6.3 ac
V-112		JAN-5R4GY OR MIL-5R4WGA:				
		1	-	-	-	-
		2	10	5.0 ac (to terminal No. 8)	10	5.0 ac (to terminal No. 8)
		3	-	-	-	-
		4	1000	680 ac	1000	680 ac
		5	-	-	-	-
		6	1000	680 ac	1000	680 ac
		7	-	-	-	-
		8	1000	240*	1000	240*
V-113		JAN-5R4GY OR MIL-5R4WGA:				
		1	-	-	-	-
		2	10	5.0 ac (to terminal No. 8)	10	5.0 ac (to terminal No. 8)
		3	-	-	-	-
		4	1000	-925	1000	-925
		5	-	-	-	-
		6	1000	-925	1000	-925
		7	-	-	-	-
		8	1000	680 ac	1000	680 ac

TABLE 4-5. VOLTAGE MEASUREMENTS—Continued

TEST POINT		20,000 ohms-per-volt-meter		1,000 ohms-per-volt meter	
Reference symbol	Tube type terminal number	Meter scale	Voltage	Meter scale	Voltage
V-114	JAN-6V6GTY:				
	1	-	-	-	-
	2	10	6.3 ac*	10	6.3 ac*
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	-15*	100	-14.5*
	6	50	-15*	100	-14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-115	JAN-6V6GTY:				
	1	-	-	-	-
	2	10	6.3 ac*	10	6.3 ac*
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	-15*	100	-14.5*
	6	50	-15*	100	-14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-116	JAN-6V6GTY:				
	1	-	-	-	-
	2	10	6.3 ac*	10	6.3 ac*
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	-15*	100	-14.5*
	6	50	-15*	100	-14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-117	JAN-0A2 OR MIL-0A2WA:				
	1	1000	-450	1000	-450
	2	1000	-600	1000	-600
	3	-	-	-	-
	4	1000	-600	1000	-600
	5	1000	-450	1000	-450
	6	-	-	-	-
	7	1000	-600	1000	-600
V-118	JAN-0A2 OR MIL-0A2WA:				
	1	1000	-300	1000	-300
	2	1000	-450	1000	-450
	3	-	-	-	-
	4	1000	-450	1000	-450
	5	1000	-300	1000	-390
	6	-	-	-	-
	7	1000	-450	1000	-450

TABLE 4-5. VOLTAGE MEASUREMENTS—Continued

TEST POINT			20,000 ohms-per-volt-meter		1,000 ohms-per-volt meter	
Reference symbol	Tube type terminal number		Meter scale	Voltage	Meter scale	Voltage
V-119		JAN-0A2 OR MIL-0A2WA:				
		1	1000	-150	1000	-150
		2	1000	-300	1000	-300
		3	-	-	-	-
		4	1000	-300	1000	-300
		5	1000	-150	1000	-150
		6	-	-	-	-
		7	1000	-300	1000	-300
V-120		JAN-0A2 OR MIL-0A2WA:				
		1	1000	0	1000	0
		2	1000	-150	1000	-150
		3	-	-	-	-
		4	1000	-150	1000	-150
		5	1000	0	1000	0
		6	-	-	-	-
		7	1000	-150	1000	-150
V-121	JAN-7F8W:	JAN-5814A:				
	1	7	250	155	1000	155
	2	9	10	6.3 ac	10	6.3 ac
	3	6	50	-15*	100	-14*
	4	8	1000	170	1000	170
	5	3	250	0	250	0
	6	1	1000	170	1000	170
	7	4,5	250	0	250	0
	8	2	50	-4.5	1000	0
V-122		JAN-0A2 OR MIL-0A2WA:				
		1	250	0*	250	0*
		2	250	-150*	250	-150*
		3	-	-	-	-
		4	250	-150*	250	-150*
		5	250	0*	250	0*
		6	-	-	-	-
		7	250	-150*	250	-150*

Page 4-43. Table 4-6 is superseded as follows:

TABLE 4-6. RESISTANCE MEASUREMENTS

NOTES

1. All resistance measurements are made with SELECTOR SWITCH in NEG SYNC position.
2. All resistance values are in ohms unless followed by "k" -kilohm (1000 ohms) or "meg" -megohm (1,000,000 ohms), tolerance ± 10%. These values are effective for all equipment unless otherwise specified. (Refer to note 8).
3. All measurements are made with respect to -325 volt supply line (any red lead), unless followed by an asterisk (*); such annotated values are measured with respect to chassis.
4. This measurement varies from 3.0 k to 1 meg, with respect to -325 volt supply line (any red lead), depending on the setting of the PULSE DELAY control.
5. This measurement varies from approximately 1 k to 100 k, with respect to chassis, depending on the setting of the PULSE WIDTH control.
6. This measurement varies from approximately 100 k to 250 k, with respect to chassis, depending on the setting of the SIGNAL FREQUENCY control.
7. Multimeter TS-352/U is used for all resistance measurements. Alternates are Simpson Model 260, Navy Model OE, or Weston Model 790.
8. Resistance value in parentheses applies to equipments of Contracts N383s-5019A, N383s-45741, and N383s-67816; other value is for equipments of Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651 and the TS-419A/U equipments.
9. Tube reference symbols in parentheses (V-101 through V-104, V-110, and V-121) refer to tube JAN-5814A, which, in Contract N383( )-89388A equipments, replaces tube type JAN-7F8W. The tube terminal numbers of type JAN-5814A, which correspond to those of type JAN-7F8W, appear at the head of the table in parentheses.

TABLE 4-6. RESISTANCE MEASUREMENTS—Continued

REFERENCE SYMBOL (Note 9)	TERMINAL NUMBERS							
	1 (7)	2 (9)	3 (6)	4 (8)	5 (3)	6 (1)	7 (4,5)	8 (2)
V-101 (V-101)	1 meg	0	10 k*	10 k	47 k*	100 k*	0	1.1 meg
V-102 (V-102)	200 k*	0	33 k*	14 k	14 k	100 k*	0	54 k
V-103 (V-103)	15 k (33 k*) (Note 8)	0	15 k* (33 k*) (Note 8)	0*	15 k*	33 k*	0*	33 k*
V-104 (V-104)	(Note 4)	0	15 k*	1.5 k (2 k) (Note 8)	1.5 k (2 k) (Note 8)	33 k*	0	0
V-105	-	0	0*	47*	100 k	-	0	19 k
V-106	-	0	15 k*	47* (1.5 K) (Note 8)	350 k (200) (Note 8)	(1.5 k) (Note 8)	0	0
V-107	-	0	3 k*	150 k*	(Note 5)	150 k*	0	0
V-108	-	0	5*	47*	220 k (165 k) (Note 8)	-	0	0
V-109	-	0	0*	47*	100 k	100 k	0	22 k
V-110 (V-110)	-	0	-	0	0	-	0	-
V-111	-	0	0	0	-	-	-	-
V-112	-	-	-	120	-	140	-	-

TABLE 4-6. RESISTANCE MEASUREMENTS—Continued

REFERENCE SYMBOL (Note 9)	TERMINAL NUMBERS							
	1 (7)	2 (9)	3 (6)	4 (8)	5 (3)	6 (1)	7 (4,5)	8 (2)
V-113	-	140	-	(Note 6)	-	(Note 6)	-	140
V-114	-	0*	-	-	33 k*	33 k*	0*	0*
V-115	-	0*	-	-	33 k*	33 k*	0*	0*
V-116	-	0*	-	-	33 k*	33 k*	0*	0*
V-117	-	(Note 6)	-	(Note 6)	-	-	(Note 6)	-
V-118	-	-	-	-	-	-	-	-
V-119	130 k (80 k) (Note 8)	-	-	-	130 k (80 k) (Note 8)	-	-	-
V-120	0	130 k (80 k) (Note 8)	-	130 k (80 k) (Note 8)	0	-	130 k (80 k) (Note 8)	-
V-121	110 k*	0	33 k*	-	0	-	0	1.15 meg*
V-122	0*	4.5 k	-	4.5 k	0*	-	4.5 k	-

Page 5-15. FO-5-3E (located in back of Change 3) is added after figure 5-3D.

Page 7-10. FO-7-1D (located in back of Change 3) is added after figure 7-1C.

Page 7-20. FO-7-2E (located in back of Change 3) is added after figure 7-2D.

Page 7-38. Appendixes I, II and III are superseded by Appendixes A, B, and C.

APPENDIX A
REFERENCES

DA Pam 310-4	Index of Technical Publications.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and and Equipment Used by the Army.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures of Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).
TM 11-6625-299-24P	Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Ohmmeters ZM-21A/U and ZM-21B/U (NSN 6625-00-634-1030).

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for the AN/URM-64 and AN/URM-64A. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accoradance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance.

If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C—Operator/Crew
O—Organizational
F—Direct Support
H—General Support
D—Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tools sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. Tool and Test Equipment Requirements (Section. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5 digit) in parentheses.

B-5. Remarks (Sect. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

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SECTION II MAINTENANCE ALLOCATION CHART
FOR

SIGNAL GENERATORS AN/URM-64 AND AN/URM-64A

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	SIGNAL GENERATORS AN/URM-64 AND AN/URM-64A	Inspect	0.1					Visual	
		Test				0.2		1 thru 11, 13	
		Service				0.2		13	
		Adjust				0.2		1 thru 11, 13	
		Align				0.3		1 thru 11, 13	
		Replace				0.1		13	
		Repair		0.3				13	
		Repair				0.5		13	A
		Overhaul					3.0	1 thru 10,12, 13	
01	SIGNAL GENERATOR TS-419/U	Inspect	0.1					Visual	
		Test				0.2		1 thru 11,13	
		Service				0.2		13	
		Adjust				0.2		1 thru 11,13	
		Align				0.3		1 thru 11,13	
		Replace				0.1		13	
		Repair		0.3				13	
		Repair				0.5		13	A
		Overhaul					3.0	1 thru 10,12, 13	
02	POWER CABLE CX-337/U (W101)	Repair		0.2				13	
		Replace		0.1				13	
03	RF CABLE CG-546/U (W102)	Repair		0.2				13	
		Replace		0.1					
04	VIDEO CABLE CC-409/U (W103)	Repair		0.2				13	
		Replace		0.1					

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

SIGNAL GENERATORS AN/URM-64 AND AN/URM-64A

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H,D	VOLTMETER, ELECTRONIC ME-303/U (HP 410C)	6625-00-902-7140	
2	H,D	GENERATOR, SIGNAL SG-967/U (HP 204C)	6625-00-669-0028	
3	H,D	FREQUENCY METER CP-772A/U (HP 5245L)	6625-00-973-4837	
4	H,D	MULTIMETER AN/USM-223	6625-00-999-7465	
5	H,D	OSCILLOSCOPE AN/USM-281C (TEK 5440)	6625-00-106-9622	
6	H,D	TEST SET, RF POWER AN/USM-260 (HP 432A)	6625-00-917-3099	
7	H,D	THERMISTOR MOUNT DT-202(*)/U (HP 475B)	6625-00-356-0236	
8	H,D	GENERATOR, PULSE SG-69A/PPM-1 (HP 212A) (HP 214B)	6625-00-542-7132	
9	H,D	GENERATOR SIGNAL TS-419/U (HP 8614B)	6625-00-257-4817	
10	H,D	SLOTTED LINE, WAVE GUIDE IM-92(*)/U (HP 805A-805C)	6625-00-692-6558	
11	H	TEST SET, ELECTRON TUBE TV-7D	6625-00-820-0064	
12	D	TEST SET, ELECTRON TUBE TV-2	6625-00-669-0263	
13	O,H,D	TOOLS AND TEST EQUIPMENT AVILABLE TO THE REPAIRMAN BECAUSE OF HIS ASSIGNED MISSION.		

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	REPLACE KNOBS, LAMPS, FUSES, ELECTRON TUBES AND THERMAL RESISTORS.

APPENDIX C
COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists integral components of and basic issue items for the AN/URM-64 and AN/URM-64A to help you inventory items required for safe and efficient operation.

C-2. General

This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. Not applicable. These items, when assembled, comprise the AN/URM-64 and AN/URM-64A and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. Not applicable. These are the minimum essential items required to place the AN/URM-64 and -64A in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the AN/URM-64 and -64A during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) Figure number. Indicates the figure number of the illustration on which the item is shown.

(2) *Item number.* The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. Following the part number, the Federal Supply Code for Manufacturers (FSCM) is shown in parentheses.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving to an adjacent area.

f. Usable on Code. Not applicable.

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during an inventory. Under the Rcvd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

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SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY	
(A) FIG NO.	(B) ITEM NO.		PART NUMBER	(FSCM)				RCVD	DATE
1-1 AND 1-2		6625-00-257-4817	SIGNAL GENERATORS TS-419/U and TS-419A/U				1		
1-1		6625-00-184-4368	CABLE ASSEMBLY, POWER, ELECTRICAL CX-337/U (6 FT)				1		
		6625-00-681-8497	CABLE ASSEMBLY, POWER, ELECTRICAL CX-3277/U (6 FT)				1		
1-4		6625-00-295-8241	CABLE ASSEMBLY, RADIO FREQUENCY CG-409A/U (8 FT , 2 IN.)				2		
1-4		5995-00-644-2570	CABLE ASSEMBLY, RADIO FREQUENCY, CG-546/U (6 FT)				1		
1-4		5935-00-259-0205	ADAPTER, CONNECTOR, UG-201/U				3		
1-4		5935-00-149-3914	ADAPTER, CONNECTOR, UG-255/U				3		
1-4		5935-00-149-3534	ADAPTER, CONNECTOR, UG -273/U				3		
1-3		6625-00-041-1645	CASE, TEST SET, CY-686/U, CY-686A/U, CY-686C/U				1		
			TECHNICAL MANUAL TM 11-6625-299-15				2		

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY	
(A) FIG NO.	(B) ITEM NO.		PART NUMBER	(FSCM)				RCVD	DATE
1-3		5920-00-474-5743	FUSE, CARTRIDGE MIL TYPE F02G3R00A	(81349)			5		
1-3		5920-00-681-0918	FUSE, CARTRIDGE, LITTLEFUSE NO. 313003	(81349)			5		
1-3		6240-00-155-8706	LAMP, INCANDESCENT, GE NO. 47	(81349)			1		

Charts Transposed to
End of Volume.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

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DEPARTMENT OF THE ARMY
Washington 25, D. C., *27 January 1959*

SIGNAL GENERATORS AN/URM-64 AND AN/URM-64A

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WARNING

THIS EQUIPMENT EMPLOYS HIGH VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED BY OPERATING PERSONNEL. EXTREME CAUTION SHOULD BE EXERCISED WHEN WORKING ON THE EQUIPMENT.

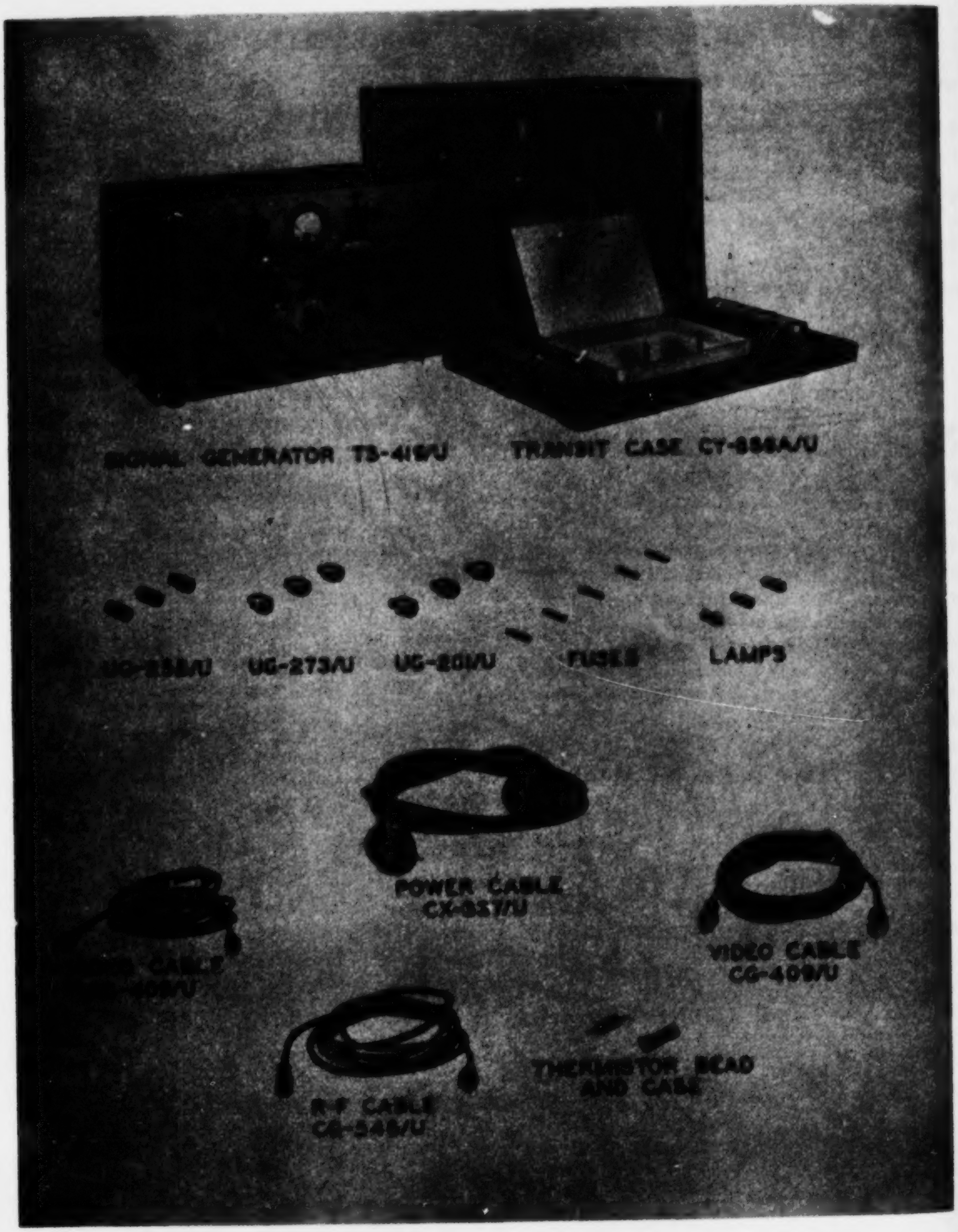

SIGNAL GENERATOR TS-419/U
TRANSIT CASE CY-858A/U
UG-255/U
UG-273/U
UG-201/U
FUSES
LAMPS
POWER CABLE
CX-337/U
CABLE
409/U
VIDEO CABLE
CG-409/U
R-F CABLE
CG-548/U
THERMISTOR BEAD
AND CASE

Figure 1-1. Signal Generator AN/URM-64

SECTION I

GENERAL DESCRIPTION

1. PURPOSE OF HANDBOOK.

The purpose of this handbook is to provide complete instructions for the operation, maintenance, and repair of Signal Generator AN/URM-64 and Signal Generator AN/URM-64A. The information contained in this handbook is applicable to all equipments manufactured under various contracts, as listed in section VI. Where essential differences exist between equipments, reference is made to the contract number and (if applicable) to the equipment serial numbers involved.

Note

Throughout this handbook, all references to Signal Generator TS-419/U also apply to Signal Generator TS-419A/U, except where specifically noted.

2. PURPOSE OF EQUIPMENT.

Signal Generator TS-419/U is a portable, self-contained, directly calibrated generator of continuous-wave or pulse-modulated radio-frequency signals. It is used for providing an accurate signal source in testing the operation of radio and radar equipment operating in the band of frequencies from 900 to 2100 megacycles per second, and for receiver measurements and other applications that require less than one milliwatt of cw or pulsed type r-f signals in this band of frequencies.

3. GENERAL PRINCIPLES OF OPERATION.

Signal Generator TS-419/U consists of four major circuits: an r-f oscillator, modulator and synchronizer, output system, and power supply. The r-f oscillator is keyed by the modulator and synchronizer to produce the desired type of output signal. The modulator may be operated independent of external synchronizing signals or may be synchronized either with positive or negative pulses, or with sine waves from an external source. An external source of positive or negative modulation can be applied to the modulator. The output system is used to establish and indicate the amount of r-f power output from the equipment. The power supply provides plate and filament power for the modulator and oscillator.

4. EQUIPMENT SUPPLIED.

See table 1-1 (figures 1-1 and 1-3) for equipment supplied with Signal Generator TS-419/U. See table 1-4 (figures 1-2 and 1-4) for equipment supplied with Signal Generator TS-419A/U.

5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

No equipment other than that listed in table 1-1 is required for operation of Signal Generator TS-419/U.

TABLE 1-1. AN/URM-64 EQUIPMENT SUPPLIED

Quantity Per Equipment	*Name of Unit*	*Army-Navy Type Designation*	*Overall Dimensions (Inches)*			*Weight (Pounds)*	*Numerical Series of Reference Symbols*
			Length or Depth	*Width or Diameter*	*Height*		
			Major Unit				
1	Signal Generator	TS-419/U	14	17-3/8	10-7/8	43	101-299
			Accessories				
1	Transit case	CY-686/U	13-1/2	21-1/16	16-1/2	18.0	A-108
*1	Transit case	CY-686A/U	13-1/2	21-1/16	16-1/2	26.5	A-108
1	Power cable	CX-337/U	72	1-1/2	—	0.75	W-101
1	R-f cable	CG-546/U	72	27/64	—	0.25	W-102
†2	Video cable	CG-409/U	72	27/64	—	0.25	W-103—W-104
3	Adapter	UG-255/U	1-5/8	3/4	—	0.06	E-166—E-168
3	Adapter	UG-201/U	1-9/16	3/4	—	0.06	E-169—E-171
3	Adapter	UG-273/U	1-5/8	3/4	—	0.06	E-172—E-174
3	Lamp		1-3/32	3/8	—	0.02	I-103—I-105
‡3	Fuse		1-1/4	1/4	—	0.02	F-105—F-107
§5	Fuse		1-1/4	1/4	—	0.02	F-105—F-109
1	Bead thermistor		1-1/8	5/32	—	0.02	TH-104

* Transit Case CY-686/U and Transit Case CY-686A/U are alternates.

† For Contracts NOa(s)-12279, N383s-75748, and N383s-77651. Length of cable is 96 inches, weight 0.35 pound.

‡ For Contracts N383s-5019A, NOa(s)-9748, N383s-45741, and N383s-67816. Quantity does not include spare fuses located on front panel.

§ For Contracts N383s-60879 and N383s-61060. Quantity does not include spare fuses located on front panel.

6. GENERAL ELECTRICAL CHARACTERISTICS.

a. POWER REQUIREMENTS. — Signal Generator TS-419/U is designed to operate from an external voltage source of 115 volts, ±10 per cent, a-c, 50 to 1600 cycles per second, single phase, without the need for voltage or frequency range switching. The required volt-amperes do not exceed 300 when the generator is operated within the limits of the line voltage and frequencies given above.

b. OPERATING RANGE. — Signal Generator TS-419/U operates throughout a band of frequencies of 900 to 2100 megacycles per second, producing cw or pulse-modulated rf at a maximum power output level of one milliwatt. An internal pulse generator permits modulation by pulses of repetition rate between 40 and 4000 pulses per second, with delay of 3 to 300 microseconds and width of ½ to 10 microseconds. Provision is made for synchronization with an external pulse or sine wave generator. Modulation by an external pulse generator is also possible.

c. DETAILED CHARACTERISTICS.—A detailed list of electrical characteristics is given in paragraph 2. of section V.

d. STANDBY HEATERS.—Standby heaters are provided. The heaters, which are located on the underside of the chassis, maintain the instrument at approximately six Centigrade degrees (eleven Fahrenheit degrees) above ambient temperature.

7. DESCRIPTION OF EQUIPMENT SUPPLIED.

a. SIGNAL GENERATOR TS-419/U.—Signal Generator TS-419/U (figure 1-2) consists of four major circuits: an r-f oscillator, a modulator and synchronizer, an output system, and a power supply. All of these circuits and their related components are mounted on a common chassis, which is enclosed in a louvered instrument case. All electrical connections are made through the front panel. All controls are directly calibrated and are mounted on the front panel. Two vertically positioned handles, which act as guard rails, are located at the extreme ends of the front panel. The panel is finished a flat grey color and the instrument case is a wrinkle grey. Small vent holes are located in the bottom of the instrument case to permit drainage of any accumulated moisture. A white indicator lamp on the front panel indicates that the space heaters within the instrument are energized and that electronic circuits are unenergized. A red indicator lamp indicates that the electronic circuits are energized and the space heaters are off. Four fuses, two of which are spares, are installed in suitable fuse holders located near the lower left hand corner of the front panel. The weight of Signal Generator TS-419/U, including the instrument case, but not including the transit case and accessories, is 43 pounds. Outline dimensions of Signal Generator TS-419/U removed from the instrument case are shown in figure 7-8. Overall dimensions, including the instrument case, are listed in table 1-1 for Signal Generator TS-419/U, and in table 1-4 for Signal Generator TS-419A/U.

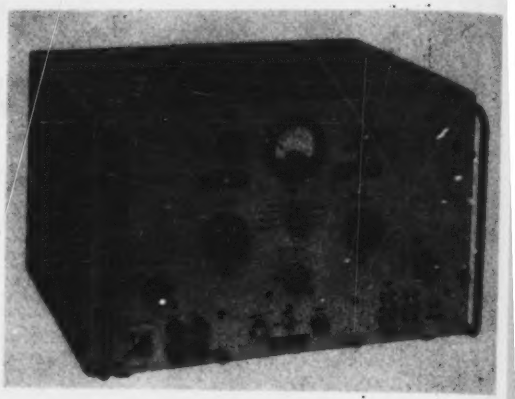
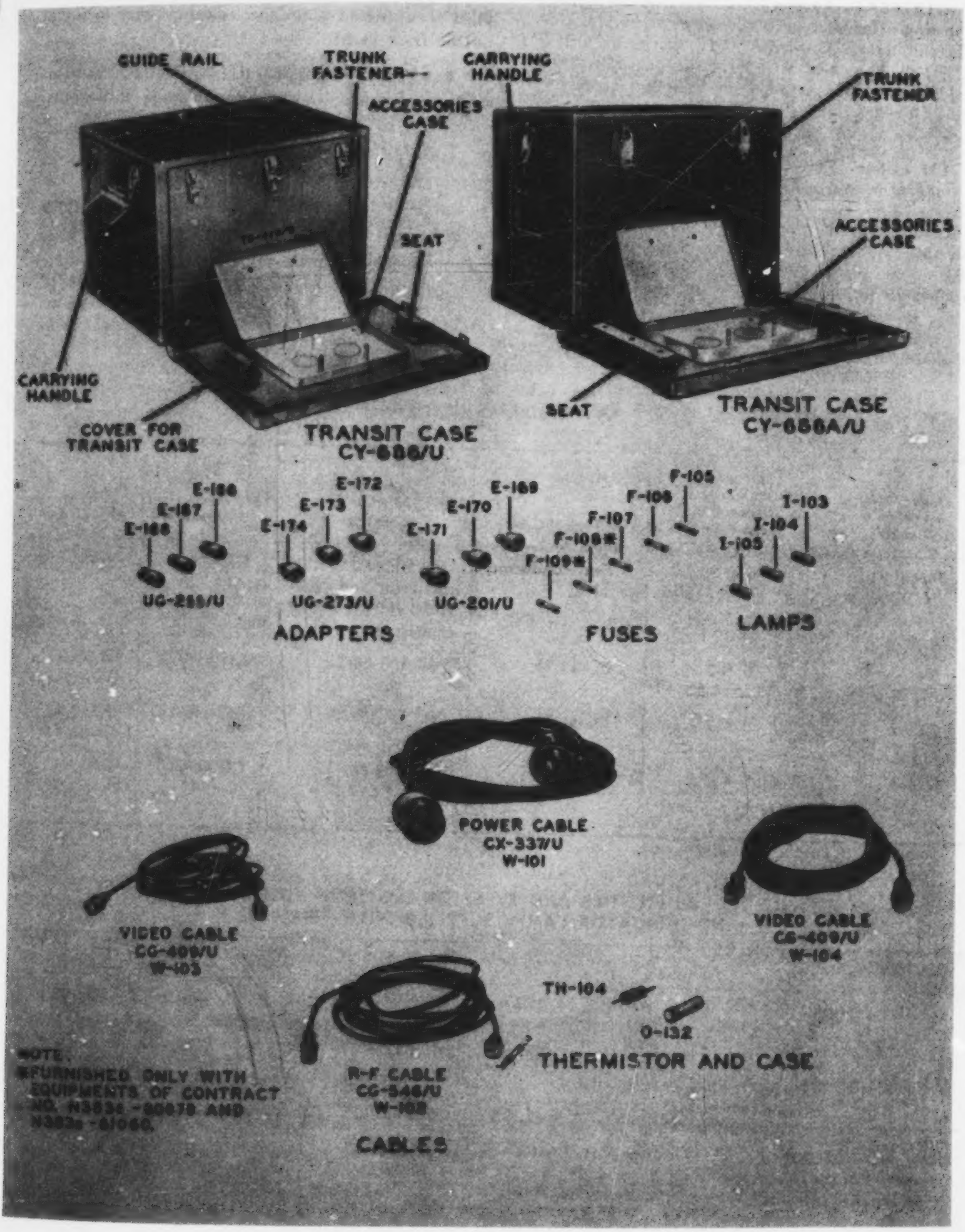


Figure 1-2. Signal Generator TS-419A/U, Right Oblique View

b. ACCESSORIES. *(See figures 1-3 and 1-4.)*

(1) TRANSIT CASE.—Transit Case CY-686/U, CY-686A/U, or CY-686C/U is supplied for transporting the signal generator and protecting it when not in use. All accessories, except the power cable (which is located within the transit case with the TS-419/U), are contained in an aluminum case fastened to the underside of the cover of the transit case. The CY-686/U and CY-686A/U differ with regard to their overall dimensions, total weight (refer to table 1-1), the number of cover latches, and the type of carrying handles. In the CY-686/U, the carrying handles are attached to the external surface at each end. In the CY-686A/U, though located in the same relative position, recessed spring-return handles are used. In the CY-686C/U, the spring-return handles are flush-mounted. All transit cases are constructed of balsa panels, covered on both sides with aluminum sheet and finished in gray enamel. The cover, which is detachable, is equipped with a molded rubber gasket, which presses against the top edges of the transit case when the cover is in position, thus providing a watertight seal. The cover is secured to the body of the CY-686/U by ten trunk-type fasteners. In the CY-686A/U and CY-686C/U, only six fasteners are used.

(2) ADAPTERS.—Three each of adapters UG-201/U, UG-255/U, and UG-273/U are supplied. These adapters provide a means for electrical and mechanical mating of various other common types of radio-frequency connectors with each other. Adapter UG-201/U provides a means for mating a female type "N" connector, such as UG-22B/U, with a male type BNC connector,


GUIDE RAIL
TRUNK FASTENER
CARRYING HANDLE
ACCESSORIES CASE
TRUNK FASTENER
SEAT
ACCESSORIES CASE
CARRYING HANDLE
COVER FOR TRANSIT CASE
TRANSIT CASE CY-686/U
SEAT
TRANSIT CASE CY-686A/U
E-186
E-187
E-188
E-172
E-173
E-174
E-169
E-170
E-171
UG-255/U
UG-273/U
UG-201/U
ADAPTERS
F-105
F-106
F-107
F-108*
F-109*
FUSES
I-103
I-104
I-105
LAMPS
POWER CABLE CX-337/U W-101
VIDEO CABLE CG-409/U W-103
VIDEO CABLE CG-409/U W-104
R-F CABLE CG-546/U W-102
CABLES
TH-104
O-132
THERMISTOR AND CASE

NOTE:
*FURNISHED ONLY WITH EQUIPMENTS OF CONTRACT NO. N383s-60878 AND N383s-61060.

Figure 1-3. Transit Case CY-686/U and CY-686A/U, and Accessories

such as UG-88/U. Adapter UG-255/U provides a means for mating a female type BNC connector, such as UG-90/U, with a male Navy type (UHF) connector, such as No. 49195; Army type PL-259A. Adapter UG-273/U provides a means for mating a male type BNC connector, such as UG-88/U, with a female Navy type (UHF) connector, such as No. 49194; Army type SO-239.

(3) FUSES—Three type 3AG, three-ampere fuses are supplied as spares for Contracts NOa(s)-9748 and NOa(s)-12279. For Contracts N383s-5019A, N383s-45741, and N383s-67816 three type AGC3 are supplied, while five are supplied for Contracts N383s-60879, N383s-61060, N383s-75748, and N383s-77651. These quantities are in addition to the two spare fuses located in fuse holders mounted on the front panel of the TS-419/U. For the TS-419A/U equipment, three MIL type FO2G3R00A 3-ampere fuses are supplied as spares.

(4) LAMPS.—Three Mazda No. 47 lamps are supplied as replacements for the indicator lamps mounted on the front panel.

(5) CABLE ASSEMBLIES.—Table 1-2 contains data on the cables and adapters supplied with Signal Generator TS-419/U.

8. QUANTITIES AND TYPES OF ELECTRON TUBES, FUSES, AND INDICATOR LAMPS.

Twenty-two electron tubes, two fuses, and two indicator lamps are required for operation of Signal Generator TS-419/U. The individual types and quantities are listed in table 1-3 for TS-419/U, and in table 1-6 for TS-419A/U.

TABLE 1-2. CABLE ASSEMBLIES SUPPLIED WITH TS-419/U

Cable and Symbol Number	*Approximate Overall Length (Connectors Included)*	*Type of Cable*	*Quantity and Type of Connector*	*Army-Navy Type Designation*	*Adapter to be Used*
Power (W-101)	6 ft	Two conductor cable	One Hubbell No. 7057 connector and One Hubbell No. 7084 connector	CX-337/U	—
R-F (W-102)	6 ft-2 in.	RG-55/U	Two UG-88/U	CG-546/U	UG-273/U UG-201/U
Video (W-103)	8 ft-2 in.	RG-58/U	Two UG-88/U	CG-409/U	UG-273/U UG-201/U
Video (W-104)	8 ft-2 in.	RG-58/U	Two UG-88/U	CG-409/U	UG-273/U UG-201/U

TABLE 1-3. QUANTITIES AND TYPES OF ELECTRON TUBES, FUSES, AND INDICATOR LAMPS SUPPLIED WITH TS-419/U

Unit	*Number of Tubes, Fuses, and Indicator Lamps of Type Indicated*						
	Tubes					*Fuses*	*Lamps*
	0A2	5R4GY	6BM6A*	6V6GTY	7F8W‡	AGC3†	GE47
Signal Generator TS-419/U	5	2	1	8	6	2	2

* Early equipments used a type 6BM6; use type 6BM6A for all replacement needs.

† Quantity does not include spare fuses.

‡ Type 7F8 used previously. For replacement use type 7F8W.

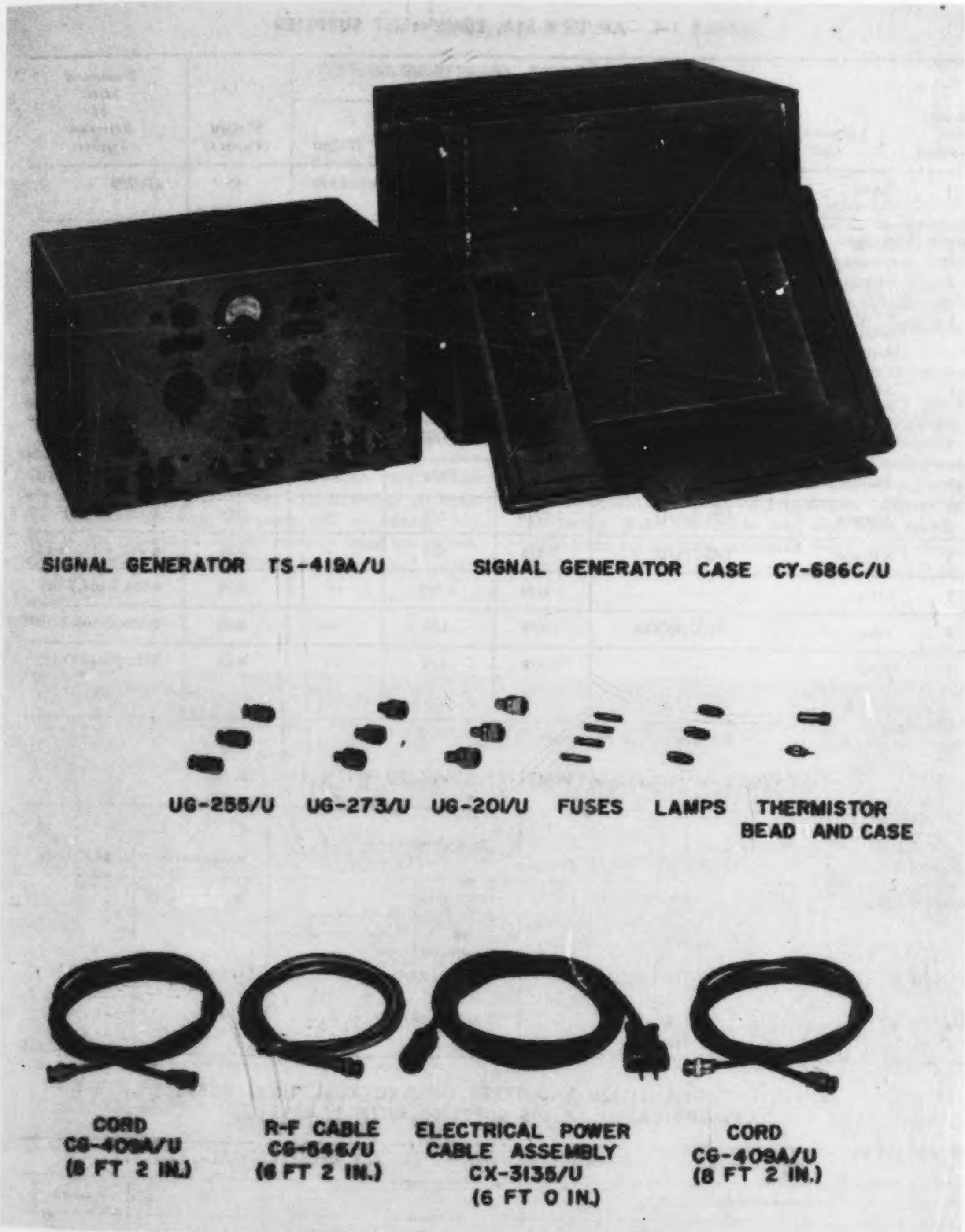

SIGNAL GENERATOR TS-419A/U
SIGNAL GENERATOR CASE CY-686C/U
UG-255/U
UG-273/U
UG-201/U
FUSES
LAMPS
THERMISTOR BEAD AND CASE
CORD CG-409A/U (8 FT 2 IN.)
R-F CABLE CG-546/U (6 FT 2 IN.)
ELECTRICAL POWER CABLE ASSEMBLY CX-3135/U (6 FT 0 IN.)
CORD CG-409A/U (8 FT 2 IN.)

Figure 1-4. Signal Generator AN/URM-64A

TABLE 1-4. AN/URM-64A, EQUIPMENT SUPPLIED

Quantity per Equipment	*Name of Unit*	*Army-Navy Type Designation*	*Overall Dimensions (Inches)*			*Weight (Pounds)*	*Numerical Series of Reference Symbols*
			Length or Depth	*Width or Diameter*	*Height*		
1	Signal Generator	TS-419A/U	14	17-3/8	10-7/8	43	101-299
1	Signal Generator Case	CY-686C/U	13-1/2	20-3/4	16-3/4	25-1/4	A-108
1	Electrical Power Cable Assembly	CX-3135/U	72	1-17/32	23/32	0.75	W-101
1	R-f Cable Assembly	CG-546/U	74	27/64	—	0.25	W-102
2	Cord	CG-409A/U	98	27/64	—	0.25	W-103, W-104
3	Adapter	UG-255/U	1-5/8	3/4	—	0.06	E-166, E-167, E-168
3	Adapter	UG-201/U	1-9/16	3/4	—	0.06	E-169, E-170, E-171
3	Adapter	UG-273/U	1-5/8	3/4	—	0.06	E-172, E-173, E-174
3	Lamp	—	1-3/32	3-3/8	—	0.02	I-103, I-104, I-105
3	Fuse	F02G3ROOA	1-1/4	1/4	—	0.02	F-105, F-106, F-107
1	*Bead Thermistor and Case	—	1-3/8	3/4	—	0.02	TH-104 and O-132

*denotes mounted in bracket, on top of Signal Generator main chassis.

TABLE 1-5. CABLE ASSEMBLIES SUPPLIED WITH TS-419A/U

Cable and Symbol Number	*Approximate Overall Length*	*Type of Cable*	*Quantity and Type of Connector*	*Army-Navy Type Designation*	*Adapter to be Used*
Power (W-101)	6 ft	3-conductor No. 18 AWG	One female. AN3106A-10SL-3S and one male UP121M, with reversible grounding blade	CX-3135/U	
R-f (W-102)	6 ft 2 in.	RG-55/U	Two UG-88/U	CG-546/U	UG-273/U, UG-201/U
Video (W-103 and W-104)	8 ft 2 in.	RG-58A/U	Two UG-88/U for each cord	CG-409A/U	UG-273/U, UG-201/U

TABLE 1-6. QUANTITIES AND TYPES OF ELECTRON TUBES, FUSES, AND INDICATOR LAMPS SUPPLIED WITH TS-419A/U

Unit	*Number of Tubes, Fuses, and Indicator Lamps of Type Indicated*						
	Tubes					*Fuses*	*Lamps*
	0A2WA	5R4WGA	6BM6A	6V6GTY	7F8W	F02G3ROOA	GE47
Signal Generator TS-419A/U	5	2	1	8	6	2	2

SECTION II

OPERATION AND ADJUSTMENT

Note

Throughout this handbook, all references to TS-419/U also apply to TS-419A/U, except where specifically noted.

WARNING

This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. Operating personnel must not remove the Signal Generator TS-419/U chassis from the instrument case. Observe all safety regulations.

1. UNPACKING AND INSPECTING THE EQUIPMENT.

Signal Generator TS-419/U or TS-419A/U installed in the transit case, is packed in a corrugated carton which, in turn, is packed in a wooden case. When unpacking the equipment, use a nail puller to open the wooden case and take care not to damage any part of the equipment during removal from the carton. After removal of the equipment, remove Signal Generator TS-419/U from the transit case and visually inspect all front panel parts, the transit case, and the instrument case for any apparent damage. Check the equipment received against the packing slip and the list of equipment supplied, table 1-1 of this handbook.

2. FUNCTION OF EQUIPMENT.

Signal Generator TS-419/U is intended for use with airborne radio and radar equipment operating in the band of frequencies from 900 to 2100 megacycles per second for receiver measurements and other applications that require less than one milliwatt of cw or pulsed-type r-f signals in this band of frequencies. Power level, frequency, pulse repetition rate, and pulse width are adjustable by directly calibrated front panel controls. Facilities are provided for synchronizing external equip-

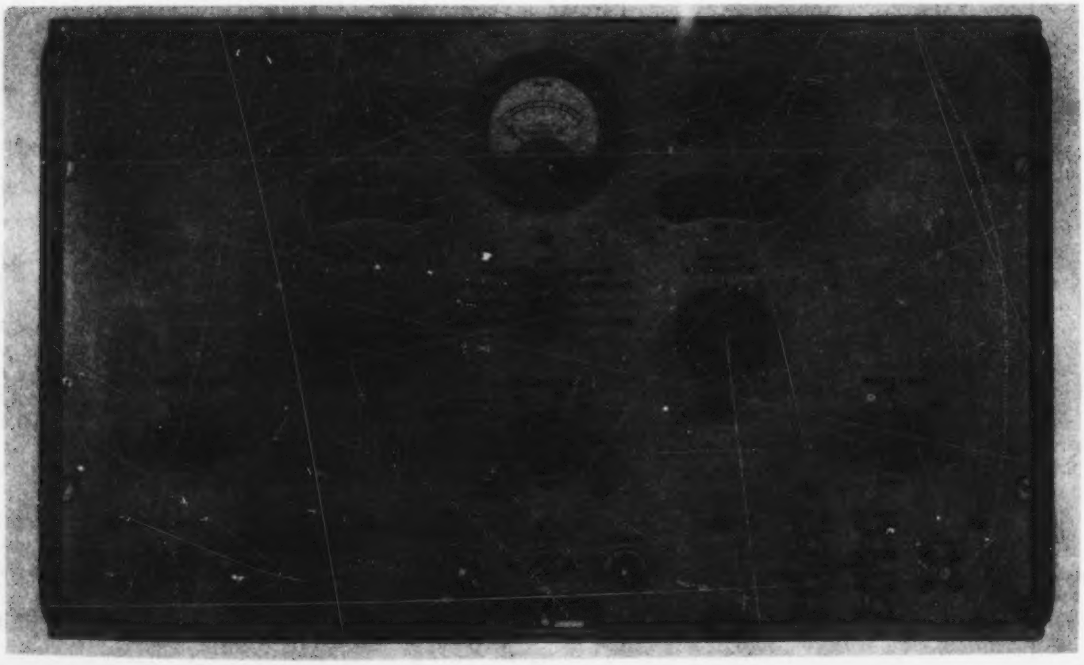


Figure 2-1. Signal Generator TS-419A/U, Front Panel View

ment with pulsed r-f signals, and for synchronizing the TS-419/U or TS-419A/U with sine waves or pulses from external equipment.

3. PRE-INSTALLATION TESTS.

The signal generator requires no pre-installation tests or adjustments previous to use, as described in the operating procedures outlined in this section. A complete list of test equipment required for maintenance tests and adjustments will be found in paragraph 4, section IV.

4. OPERATING CONTROLS.

Before making any measurements with the signal generator, operating personnel must review and become familiar with the function and placement of all controls, connectors, and other detailed parts necessary for the operation and maintenance of the equipment. All operating controls, dials, connectors, and indicating devices are explained briefly by the adjacent panel markings. Table 2-1 lists these components (approximately left to right) according to front panel markings and describes in more detail the function of each.

5. STARTING THE EQUIPMENT.

a. To start the equipment proceed as follows:

(1) Connect Power Cable CX-337/U (for TS-419/U) or CX-3135/U (for TS-419A/U) between the connector marked POWER INPUT and a nominal 115-volt, a-c, 50- to 1600-cps power source. The AN type UP121M three-prong connector of CX-3135/U is designed for mating a power source outlet which has one of its terminals connected to ground potential. In the event that a three-contact power source outlet is not available at the testing location, the ground prong on the UP121M shell may be rotated 180 degrees from its normal contacting position. When operating under this condition, be sure to connect the spade lug terminal (attached to the UP121M shell), to a separate source of earth ground.

Note

With the connection of the power cable, power is supplied to the space heaters used in this equipment and will remain energized until the POWER OFF ON switch is thrown to the ON position or until the power cable is disconnected.

(2) Throw the POWER OFF ON switch to the ON position. Allow a ten-minute warm-up period.

TABLE 2-1. OPERATING CONTROLS, DIALS, CONNECTORS, AND INDICATING DEVICES

Panel Designation	*Function*
	Operating Controls
POWER SET	Adjusts power delivered to the r-f output attenuator.
LOCK (To left of POWER SET)	Locks POWER SET control.
ZERO SET	Adjusts the electrical balance of the power monitor bridge circuit.
LOCK (To right of ZERO SET)	Locks ZERO SET control.
SIGNAL FREQUENCY	Selects and indicates the output r-f signal frequency.
LOCK (Below SIGNAL FREQUENCY)	Locks SIGNAL FREQUENCY control.
NEG MOD, POS MOD, RATE X10, RATE X1, CW, ZERO SET, POS SYNC, NEG SYNC, SIN SYNC **Note** *Hereinafter the* NEG MOD, POS MOD, etc. control will be referred to as SELECTOR SWITCH.	Selects output r-f signal characteristics. At NEG MOD and POS MOD the output r-f signal is a pulse signal having a rate equal to, and an envelope shape similar to, that of either a negative or positive modulation signal furnished to the TS-419/U from an external source. At RATE X10, or RATE X1, the output r-f signal is an unsynchronized pulse signal having a repetition rate selected by the front panel PULSE RATE control multiplied by either 10 or 1. At CW, the output r-f signal is not modulated. At ZERO SET, the output r-f signal is cut off to allow adjustment of the power monitor bridge balance by means of the front panel ZERO SET control. At POS SYNC, NEG SYNC, SIN SYNC, the output r-f signal is a pulse signal, synchronized with, and having a rate equal to that of a positive pulse, a negative pulse, or a sine wave signal, furnished to the TS-419/U from an external source.
OUTPUT ATTENUATOR	Controls and indicates the amount of attenuation of the r-f output signal.
LOCK (Below OUTPUT ATTENUATOR)	Locks OUTPUT ATTENUATOR control.

TABLE 2-1. OPERATING CONTROLS, DIALS, CONNECTORS, AND INDICATING DEVICES (Cont.)

Panel Designation	*Function*
	Operating Controls (Cont.)
PULSE WIDTH	Varies the width of the output pulse from ½ to 10 microseconds between the points which are 50 percent of maximum amplitude of initial rise.
PULSE DELAY	Delays the output pulse relative to internal or external synchronizing voltage over the range of 3 to 300 microseconds.
PULSE RATE	Selects the pulse repetition rate over the range 40 to 4000 pps when the pulse rate is determined internally. Two ranges are used, viz: RATE X10 and RATE X1.
POWER OFF ON	A-c power switch.
	Dials
MC	Direct reading signal frequency dial over the range of frequencies from 900 to 2100 mc/sec without band switching.
DBM-μV	Direct reading output attenuator dial with equivalent microvolt scale beneath.
	Indicating Devices
POWER SET-ZERO SET (METER M-101) **Note** There is no panel marking for this meter, except as marked; however, hereinafter this power output meter will be referred to as METER.	Indicates power delivered to output attenuator.
HEATER	Indicates application of power to space heater only.
POWER	Indicates application of power to all circuits and removal of power from space heater.
	Connectors
POWER INPUT 115 V 50-1600 CPS **Note** Hereinafter this will be referred to as POWER INPUT.	Primary power input connection.
SYNC IN	Connector for incoming external synchronizing signal.
EXT MOD	Connector for incoming external modulation signal for the r-f oscillator.
SYNC OUTPUT UNDELAYED	Connector at which appears a pulse signal of more than 20 volts peak. This pulse coincides with the leading edge of the incoming external synchronizing pulse or with the internally generated pulse.
SYNC OUTPUT DELAYED	Connector at which appears a pulse signal of more than 20 volts peak. This pulse coincides with the leading edge of the pulse appearing at the R-F OUTPUT connector. It may be delayed from 3 to 300 microseconds relative to the incoming external synchronizing pulse, or relative to the internally generated pulse.
R-F OUTPUT	Connector at which appears the r-f output from the variable attenuator.

6. OPERATING PROCEDURES.

CAUTION

If the R-F OUTPUT connector of Signal Generator TS-419/U is connected to a source of power such as a transpondor, suitable attenuators must be used to limit power dissipation in the attenuator termination to 0.5 watt average or 10 watts peak.

a. CW OPERATION.—Most of the functions which can be fulfilled by Signal Generator TS-419/U involve the use of the r-f oscillator. The procedure for placing it into cw operation is as follows:

(1) Set the SIGNAL FREQUENCY control to the desired output frequency.

(2) Set the SELECTOR SWITCH to ZERO SET and adjust the ZERO SET control until the METER reads exactly at the meter dial line marked ZERO SET.

(3) Turn the SELECTOR SWITCH to CW. The positions of the pulse controls during cw operation are not significant.

(4) Adjust the POWER SET control until the METER reads exactly zero dbm (half-scale). This establishes the reference level for the output voltage. Any desired output from —3 dbm (0.16 volt) to —121 dbm (0.2 microvolt) can now be obtained by adjusting the OUTPUT ATTENUATOR. The output power into a 50-ohm resistive load, or the voltage across such a load, may be read directly from the appropriate output attenuator dial scale. For evaluation of errors due to unmatched loads, refer to paragraph 3. of section V.

Note

When measuring small differences in output level, always approach the final OUTPUT ATTENUATOR setting from the same direction, in order to minimize errors from backlash.

(5) When outputs greater than —3 dbm are required, it is necessary to set the METER to some reading between zero and +3 dbm by adjusting the POWER SET control. The recommended reference reading is +3 dbm. Adjustment of the OUTPUT ATTENUATOR will provide an output range from zero to −118 dbm.

Note

Adjustment of the POWER SET control will cause a noticeable change in the frequency of the r-f output. The frequency will be within ±1 percent of the value indicated by the signal frequency (MC) dial for any adjustment of the POWER SET control which produces on-scale meter readings. The dial is calibrated for a zero dbm meter reading and the most accurate frequency indications are obtained at this adjustment.

(6) If the METER is set at a reading other than zero dbm, the reading must be algebraically added to the OUTPUT ATTENUATOR reading in order to know the true r-f output. The following examples show the correct method of determining the power output for power settings other than zero dbm:

OUTPUT ATTENUATOR (—dbm)	—3	—3	—3	—3	—34	—34
METER (±dbm)	0	+1	+2	+3	+3	—5
Actual Power Output (dbm)	—3	—2	—1	0	—31	—39

Note

The output levels as determined above apply only when the RF OUTPUT connector is terminated in a 50-ohm resistive load.

Any deviation of the monitor level from zero dbm or other reference level, such as that caused by adjustment of the OUTPUT ATTENUATOR, should be corrected by using the POWER SET control to restore the reference reading of the METER. This may occur between an attenuator reading of —3 and —10 dbm.

b. PULSED OPERATION.—The operative steps (1) through (6) of paragraph 6.*a.* of this section are required when Signal Generator TS-419/U is to be pulse-modulated, since the amplitude of the pulse is established by reference to the cw amplitude. *The monitor reading will decline to practically zero when pulse modulation is applied, since the average power level will be at a low value.*

c. USE OF SIGNAL GENERATOR TS-419/U TO PROVIDE UNSYNCHRONIZED PULSED R-F SIGNALS.—To use Signal Generator TS-419/U to provide unsynchronized pulsed r-f signals, proceed as follows:

(1) Perform the operative steps listed in paragraph 6.*a.*, this section.

(2) Set the SELECTOR SWITCH to either RATE X10 or RATE X1 and set the PULSE RATE control to give the desired pulse repetition rate. The combined use of these controls permits the selection of any PRR (pulse repetition rate) from 40 to 4000 pulses per second.

(3) Adjust the PULSE WIDTH control to vary the pulse width. The available range is from ½ to 10 microseconds.

(4) If it is desired to delay the timing of the r-f output pulse with respect to the SYNC OUTPUT UNDELAYED, adjust the PULSE DELAY control. This control provides a delay, at the lower repetition rates, from 3 to 300 microseconds. Maximum delay should not be used

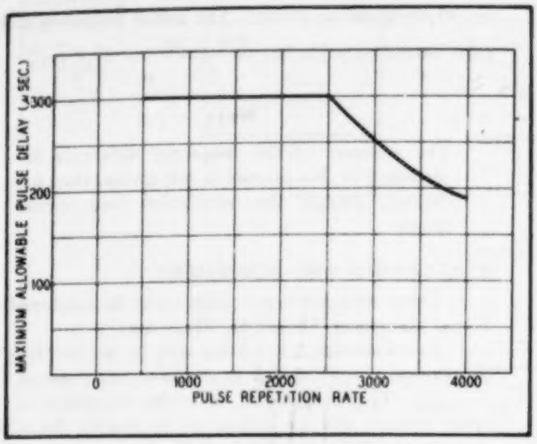


Figure 2-2. Signal Generator TS-419/U, Graph of Maximum Allowable Pulse Delay Versus Pulse Repetition Rate

when PRR is higher than approximately 2500 as the pulsing may become irregular. In addition, as the PRR is increased, less delay must be used until, at the highest PRR, a delay of about 190 microseconds is the maximum that can be used. A graph of the maximum allowable pulse delay for the PRR range is shown in figure 2-2.

(5) Both a delayed and an undelayed video sync pulse are available for external use. To obtain the delayed sync pulse connect Video Cable CG-409/U to the front panel connector marked SYNC OUTPUT DELAYED. To obtain an undelayed sync pulse connect Video Cable CG-409/U to the SYNC OUTPUT UNDELAYED connector. *(Cord CG-409A/U is interchangeable with CG-409/U.)*

d. SYNCHRONIZATION OF THE PULSED R-F OUTPUT SIGNALS WITH AN EXTERNAL SIGNAL.—The pulsed r-f output signals may be synchronized with an external signal having a repetition rate in the range from 40 to 4000 cycles per second. To obtain synchronization, connect Video Cable CG-409/U, carrying the external synchronizing signal, to the front panel connector marked SYNC IN and, depending on the nature of the synchronizing signal, that is, whether it is a positive pulse, a negative pulse, or a sine wave, turn the SELECTOR SWITCH to either the POS SYNC, NEG SYNC, or SIN SYNC position. (Refer to paragraphs 2.*a.*(8) of section V for synchronizing signal requirements.) Refer to paragraphs 6.*c.*(3) through 6.*c.*(5) of this section for control of the pulse width and pulse delay, and the availability of sync output pulses.

e. MODULATION OF THE OSCILLATOR WITH AN EXTERNAL PULSE SIGNAL.—If it is desired to modulate the oscillator with an external pulse signal, that external signal must possess the characteristics enumerated in paragraph 2.*a.*(8) of section V. Connect Video Cable CG-409/U, carrying the external signal, to the EXT MOD connector and, depending on the polarity of the external pulse signal, set the SELECTOR SWITCH to either NEG MOD or POS MOD.

f. PROVISION OF SYNC OUTPUT FOR EXTERNAL USE.

(1) Sync pulses for external use can be obtained when the modulation rate is generated either internally or by synchronization with an external signal. The sync outputs obtained under these conditions are positive video pulses, one of which is delayed and the other undelayed. The delayed pulse occurs simultaneously with the leading edge of the r-f output pulse. The undelayed pulse occurs earlier than the r-f output pulse. This difference in time corresponds to the setting of the PULSE DELAY control. When external pulse synchronization is employed, the undelayed sync output pulse occurs simultaneously with the leading edge of the input sync pulse. The delayed pulse is obtained at the connector marked SYNC OUTPUT DELAYED. The undelayed pulse is obtained at the connector marked SYNC OUTPUT UNDELAYED.

(2) If the oscillator is externally modulated, a sync pulse of positive polarity will appear at the SYNC OUTPUT DELAYED connector. This pulse occurs simultaneously with the leading edge of the r-f output pulse and the leading edge of the external modulating pulse.

(3) Characteristics of the sync output pulses are described in section V, paragraph 2.*a.*(10).

7. USE OF SIGNAL FREQUENCY INTERPOLATION SCALES.

a. Except in serial no. 1-150 manufactured under Contract No. NOa(s)-9748, Signal Generator TS-419/U is equipped with an additional scale on the signal frequency dial, located behind the transparent window, which counts the revolutions of the SIGNAL FREQUENCY control, and with a scaled dial on the SIGNAL FREQUENCY control knob, which is calibrated from 0 to 100. Taken together, these scales permit accurate determination of small increments of frequency, as required in certain types of selectivity and filter characteristic measurements.

b. To determine the frequency difference between two settings of the SIGNAL FREQUENCY control, when these settings are too close to obtain satisfactory accuracy from the direct dial calibrations, proceed as follows:

(1) Note the reading of the signal frequency dial and the reading on the 0 to 100 scale on the SIGNAL FREQUENCY control knob for each frequency setting. Always approach the final SIGNAL FREQUENCY settings from the same direction in order to minimize errors from backlash.

(2) Subtract the smaller of these numbers from the larger.

(3) Determine in the same manner the number of divisions for a 10-megacycle frequency change.

(4) Divide the difference obtained in step (2) by this number and multiply the result by 10 to obtain the frequency difference in megacycles.

Note

When measuring small frequency differences, do not readjust POWER SET control between readings. Use the meter scale as described in paragraph 6.*a.*(6), this section, to correct output attenuator readings for change in power level. Failure to use this procedure may lead to serious error in the measurement of small frequency differences.

c. To illustrate the procedure outlined in paragraph 7.*b.*, this section, the following example is provided. Assume a dial setting of 45 on the lower scale of the signal frequency dial and 73 on the SIGNAL FREQUENCY control. The combination is read as 4573. This corresponds to a frequency of approximately 1431 mc. Similarly, a reading of 4832 corresponds to a frequency of approximately 1488 mc. The difference between these readings equals 259. At a frequency of 1460 mc there are 45 divisions in 10 mc. The actual frequency difference therefore will be $\frac{259 \times 10}{45} = 57.5$ mc.

Note

The accuracy of the frequency difference determined in this manner is not greater than 0.2 mc/sec, though the calculation may appear closer.

8. STOPPING THE EQUIPMENT.

a. Three shut-down procedures may be employed for Signal Generator TS-419/U. These are:

(1) Functional operation may be stopped by placing the SELECTOR SWITCH in the ZERO SET position.

(2) The equipment, with the exception of the space heaters, may be shut down by placing the POWER OFF ON switch in the OFF position.

(3) Complete shutdown of the equipment is accomplished only by removal of Power Cable CX-337/U (on the TS-419/U) or Electrical Power Cable Assembly CX-3135/U (on the TS-419A/U) from the POWER INPUT connector.

SECTION III

THEORY OF OPERATION

1. INTRODUCTION.

a. Signal Generator TS-419/U is a test set that provides r-f signals in the range of 900 to 2100 megacycles per second at amplitudes of 0.16 volt (−3 dbm) to 0.2 microvolt (−121 dbm). The equipment is designed to provide signals to external loads of 50 ohms resistance.

b. Signal Generator TS-419/U provides both continuous-wave and pulse-type radio-frequency output signals. Pulse signals may be derived from either an internal or external source of modulation signal. When pulse signals are derived from the internal modulator, these pulse signals may be synchronized with signals from either an internal or an external source. Provision is included in Signal Generator TS-419/U for delaying the pulse output signal relative to the synchronizing signal.

c. The TS-419/U also generates delayed and undelayed video pulses that can be used by external equipment. The delayed pulse coincides with the leading edge of the r-f output pulse, while the undelayed pulse coincides with the leading edge of the synchronizing pulse.

2. BLOCK DIAGRAM.

The basic circuit of Signal Generator TS-419/U comprises four functional systems as shown in figure 3-1: the r-f oscillator, the output system, the modulator and synchronizer, and the power supply. The r-f oscillator is keyed by the modulator and synchronizer to produce the desired r-f output. The output system determines the amount of r-f power available to the load and provides a direct-reading power output control. The power supply provides plate and filament power to the entire equipment. Complete schematic diagrams of Signal Generator TS-419/U are shown in figures 7-1, 7-1A, 7-1B and 7-1C. Each of the four functional systems is described in detail in the following paragraphs.

3. R-F OSCILLATOR.

a. The r-f oscillator performs the prime function in Signal Generator TS-419/U, generating the r-f power that is delivered to the external load. The oscillator employs a 6BM6A reflex klystron (velocity modulation type) in a coaxial cavity resonator. The tube is called a *reflex* klystron because a single set of grids performs the dual function of bunchers and catchers for the electron stream. An equivalent circuit for the r-f oscillator and associated output system is shown schematically in figure 3-2.

Note

Early equipments used a type 6BM6. The type 6BM6A supersedes the 6BM6 and should be used for all replacement purposes.

b. The resonant circuit L and C in figure 3-2 connects to the resonator grids in klystron tube. Interposed between the resonator grids and the cathode is the focusing grid. On the other side of the resonator grids the reflector electrode, which is at a high negative potential, acts to repel the electrons. All three grids are of relatively open construction and permit the free passage

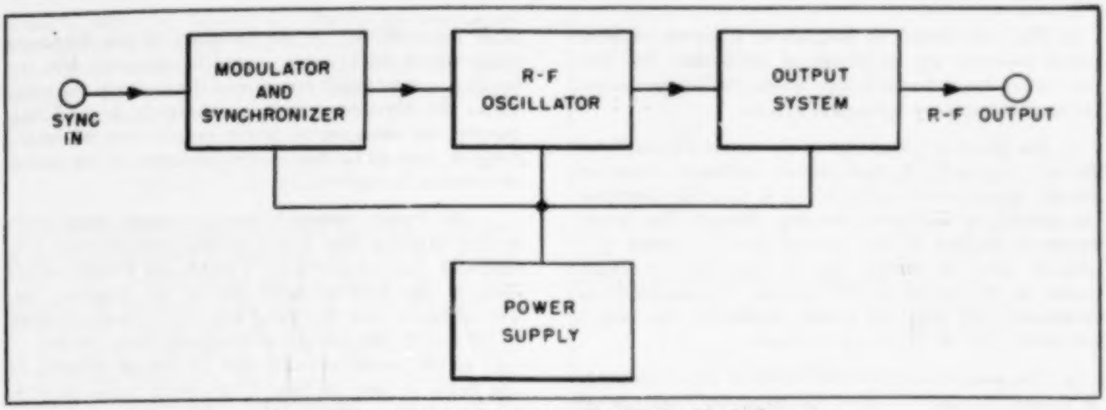
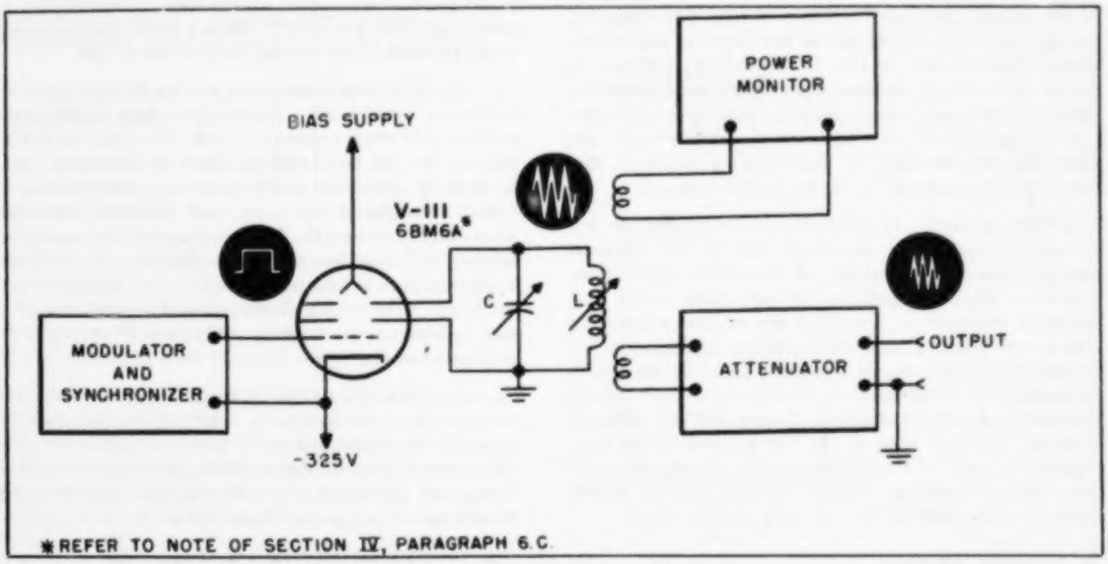


Figure 3-1. Signal Generator TS-419/U, Block Diagram



*REFER TO NOTE OF SECTION IV, PARAGRAPH 6.C.

Figure 3-2. Equivalent Circuit for R-F Oscillator and Output System

of electrons when their relative potentials are of the proper magnitude.

c. With the circuit of figure 3-2 in an oscillatory condition, its operation can be explained as follows: The tank circuit L and C, and the resonator grids to which they are connected, are highly positive with respect to the cathode. In addition, the focusing grid has been brought up to the cathode potential by the modulating pulse so that electrons are beamed through the resonator grids.

d. Because the circuit is oscillating, an a-c voltage exists across the tank circuit L and C. This same voltage exists between the resonator grids so that the field between the grids is constantly changing, sometimes aiding the passage of electrons and sometimes opposing the passage of electrons. Thus, as the electrons from the cathode pass through the resonator grids, some are accelerated, while those passing through an instant later are decelerated. The electrons then travel towards the highly negative reflector electrode, some with more velocity than others. The high negative potential of the reflector causes the electrons to reverse their direction of travel and proceed back toward the resonator grids. The electrons which were accelerated travel farther than those which were decelerated, so that both types arrive back at the resonator grids at the same time or in a bunch. The amplitude of the reflector voltage is such that the bunched electrons arrive back at the resonator grids at a time when the field between the resonator grids opposes the passage of electrons. The electrons thus give up energy to the resonator grids and this energy is "stored" in the tank circuit, sustaining the oscillations.

e. The tank circuit is coupled to a power monitor which monitors the amplitude of oscillation. The output power from the oscillator is coupled to the output terminal through an attenuator system.

f. The tuned circuit shown in the equivalent oscillator circuit of figure 3-2 is, in the actual oscillator, a resonant coaxial quarter-wave cavity which is tuned by changing the position of the cavity shorting plunger. The output power is coupled to the external load by means of a pick-up loop. A similar loop is provided to supply power to the output monitor so that the amplitude of oscillation and thus the power applied to the output attenuator can be known at all times.

g. The general and exploded views of the r-f assembly in figures 7-6 and 7-7 show the actual oscillator circuit used in the signal generator. The resonant cavity is built in the form of a coaxial transmission line, with cylinder Y-101 within the outer cylinder Y-102. The shorting plunger E-101 shorts the line at the opposite end of the cavity from the tube V-111. If the shorting plunger is set so that it is one-quarter wavelength away from the tube, the cavity appears as a high impedance to the tube and is equivalent to a parallel resonant circuit. By changing the position of the shorting plunger, the resonant frequency of the cavity is also changed.

h. The frequency of oscillation is determined by the resonant frequency of the cavity and by the reflector voltage. For a given setting of the cavity there is an optimum value of reflector voltage that causes the bunched electrons to return to the resonator grids at the proper time. A continuous change in frequency by means of a single control is accomplished in the signal generator by a mechanical arrangement that simultaneously adjusts the shorting plunger and the reflector voltage. The gear train O-101, O-115, and O-119 (see figures 7-5 and 7-7) links the angular displacement of the reflector tracking voltage variable resistor R-185 with the movement of the shorting plunger E-101.

4. OUTPUT SYSTEM.

a. R-F OUTPUT. (*See figure* 7-7.)

(1) The r-f power output from the oscillator is extracted from the oscillator by means of an adjustable coupling line Y-103. The small capacity provided by the button C-129 on the end of the line Y-103 couples the line to the inner conductor Y-101 of the coaxial cavity Y-102. The amount of pickup is adjusted when the POWER SET knob is rotated. This action, through shaft assembly O-113, moves the inner conductor Y-103 of the coupling line in and out of the cavity Y-102. The load end of the coupling line is short-circuited, giving it the properties of a resonant circuit. Its length is one-quarter wavelength long at a frequency slightly lower than the lowest operating frequency of 900 mc/sec, and three-quarters of a wavelength long at a frequency slightly higher than the highest operating frequency of 2100 mc/sec. This arrangement extracts power efficiently from the oscillator at the extremes of the frequency range where the klystron output is inherently low and does not extract much power near the center of the range where the klystron output is inherently high. Consequently, the variation of power output over the tuning range is reduced so that less readjustment of the POWER SET control is required.

(2) Power extracted from the coaxial cavity Y-102 by the coupling line Y-103 is delivered into two symmetrically located apertures, Y-104A and Y104B, located close to the short-circuited end of the coupling line. The apertures feed the power into two sections of tubing, Y-105 and Y-106, acting as waveguide feeds—below cut off—to the power monitor and r-f output sections, respectively. A loop in tube Y-105 feeds power into the power monitor system. Since the two apertures are symmetrical, a known power in tube Y-105, as indicated by the panel power meter, insures that a similarly known power level exists in tube Y-106 at a point corresponding to the position of the pickup loop in tube Y-105.

(3) The loop termination resistor R-160 located in the piston O-107 feeds a coaxial line which is connected to the R-F OUTPUT connector, J-105. The value of R-160 matches the characteristic impedance of this coaxial line. By moving the piston O-107 inside the tube Y-106, the effective length of the tube, and therefore the total attenuation, is varied. The attenuation expressed in decibels is a linear function of the distance of R-160 from Y-103. In practice, the attenuation is not an exact linear function of the piston displacement for small displacements. This is countered by calibration of the OUTPUT ATTENUATOR dial.

(4) The adjustment of the attenuator piston, and the resulting attenuation, is regulated by the train of gears O-108, O-109, and shafts O-110, O-111, connecting the piston O-107 to the OUTPUT ATTENUATOR control knob, and associated gears O-116, O-117, O-118, and dial N-102. (See figures 7-5 and 7-7.)

b. POWER MONITOR. (*See figure* 7-7.)

(1) GENERAL.—As stated in paragraph 4.*a.*(2), this section, the loop in tube Y-105 feeds power into the power monitor system. The power monitor system is a thermistor bridge circuit that includes the panel meter M-101, used in determining the output power level. Bead and disc thermistors are used in the signal generator. The bead thermistor TH-103 has a small mass and is used for power measurement. It is located in the cavity, and changes in its resistance can be caused by thermal changes in environment, by direct currents flowing through it, or by absorbed r-f power. The two disc thermistors TH-101 and TH-102 have a much larger mass. They are mounted outside the cavity and their resistance is dependent primarily on the ambient temperature.

(2) BASIC THERMISTOR BRIDGE CIRCUIT. (*See figure* 3-3.)—The basic thermistor bridge circuit is

shown in part A of figure 3-3. The bridge consists of R-153, R-154, R-155, and bead thermistor TH-103. Current will not flow in meter M-101 when the bridge is balanced. The bridge is balanced when the resistances meet the following conditions:

$$\frac{\text{R-154}}{\text{TH-103}} = \frac{\text{R-153}}{\text{R-155}}$$

With no r-f power heating the bead thermistor TH-103, the bridge is balanced by adjusting the ZERO SET control R-145. This control varies the d-c current in TH-103, changing the thermistor temperature. Since the thermistor resistance changes with temperature, the resistance of TH-103 can be adjusted to balance the bridge. After the thermistor bridge has been balanced, r-f power to be measured is fed to the power monitor. The r-f power absorbed by TH-103 increases its temperature, decreasing its resistance and unbalancing the bridge so that current flows through M-101. Current flow through the meter is proportional to the r-f power absorbed by TH-103.

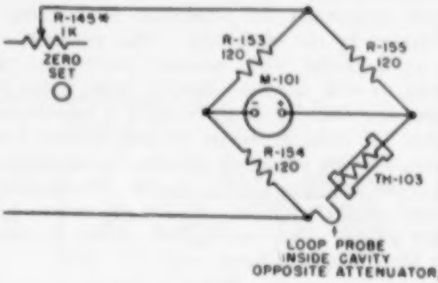
(3) COMPLETE THERMISTOR BRIDGE CIRCUIT. (*See figure 3-3.*)

(*a*) Because the bead thermistor TH-103 used in the bridge is temperature-sensitive, the bridge would tend to drift appreciably from its zero setting as the cavity temperature increased or decreased. In addition, the sensitivity of the bridge would increase as the temperature decreased. Two disc thermistors are used as bridge-drift and sensitivity-compensating devices. They are physically mounted directly upon the cavity so that they are maintained as close to cavity temperature as possible.

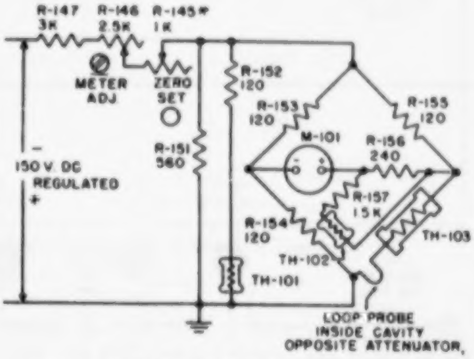
(*b*) The disc thermistor TH-101 shunted across the bridge compensates for changes in ambient temperature. In the presence of ambient temperature changes, its d-c resistance changes, thereby changing the d-c voltage across the bridge. The compensating change of voltage across the bridge alters the current through bead thermistor TH-103. The change in TH-103 current changes its resistance in a direction that counters the change in its resistance caused by the ambient temperature change. Thermistor TH-101 is incorporated in a network with R-151 and R-152 which is designed to keep the resistance of thermistor TH-103 almost constant over a range of ambient temperatures. Thus, the bridge can be zero-set and will remain in balance to a relatively high degree.

(*c*) Because of the inherent characteristic of thermistor bridges to increase in sensitivity as the ambient temperature decreases, the compensating network of disc thermistor TH-102, R-156, and R-157 has been placed in series with the meter M-101. This network varies the meter resistance in the balance circuit across the bridge so that the sensitivity of the bridge remains constant over the required temperature range.

(*d*) The d-c bridge potential is applied through the series circuit of R-147, R-146, and R-145. ZERO SET R-145 is a front panel control that adjusts the electrical balance of the power monitor bridge circuit. ZERO ADJ R-146 is a screw-driver control used to enable R-145 to center on the required adjustment range.



PART A - BASIC CIRCUIT



PART B - COMPLETE CIRCUIT

*IN CONTRACT N383s-5019A,
R-145 = 1.5K

Figure 3-3. Signal Generator TS-419/U, Power Monitor Thermistor Bridge, Schematic Diagram

5. MODULATOR AND SYNCHRONIZER.

a. GENERAL.

(1) The modulator and synchronizer includes tubes V-101 and V-110. The basic function of the modulator is to generate a positive video pulse of desired characteristics and to apply that pulse to the focusing grid of the reflex klystron V-111, so that V-111 will oscillate for the duration of the pulse.

(2) A block diagram of the modulator and synchronizer is shown in figure 3-4. The rate multivibrator V-102 determines the repetition rate of the pulses generated by the modulator. This multivibrator can be synchronized with external positive or negative pulses, or with sine-wave signals. Also, it can generate pulses as a result of its operating in a free-running condition. In order to trigger the multivibrator from sine waves, the sine waves are converted to square waves in the input amplifier V-101. An RC differentiator at the output of the amplifier converts the square waves to short pulses. The resulting waveforms are shown in the block diagram, figure 3-4.

(3) The output of the rate multivibrator is a negative pulse, the leading edge of which is coincident with the leading edge of the synchronizing voltage as shown by time T_0. This negative pulse is differentiated by an RC network, giving a short negative pulse at time T_0 and a short positive pulse at a time coincident with the trailing edge of the multivibrator pulse. These short pulses are applied to the clipper V-103A which is designed to pass only the short negative pulse occurring at time T_0. This short negative pulse is then applied to and triggers the delay multivibrator V-104.

(4) The delay multivibrator V-104 is provided as a means for supplying a time delay between the external synchronizing voltage and the video pulse which is eventually applied to the klystron V-111. The positive pulse generated by the delay multivibrator V-104 is adjustable in duration over a range from 3 to 300 microseconds and the length of this pulse determines the amount of delay in the circuit. The delay pulse is differentiated by an RC network, giving a short positive pulse at the leading edge of the pulse (time T_0) and a short negative pulse at the trailing edge of the pulse (time T). The positive pulse at time T_0 is shorted out, however, by the clipper V-103B, leaving only the negative pip at time T. It should be noted that the time

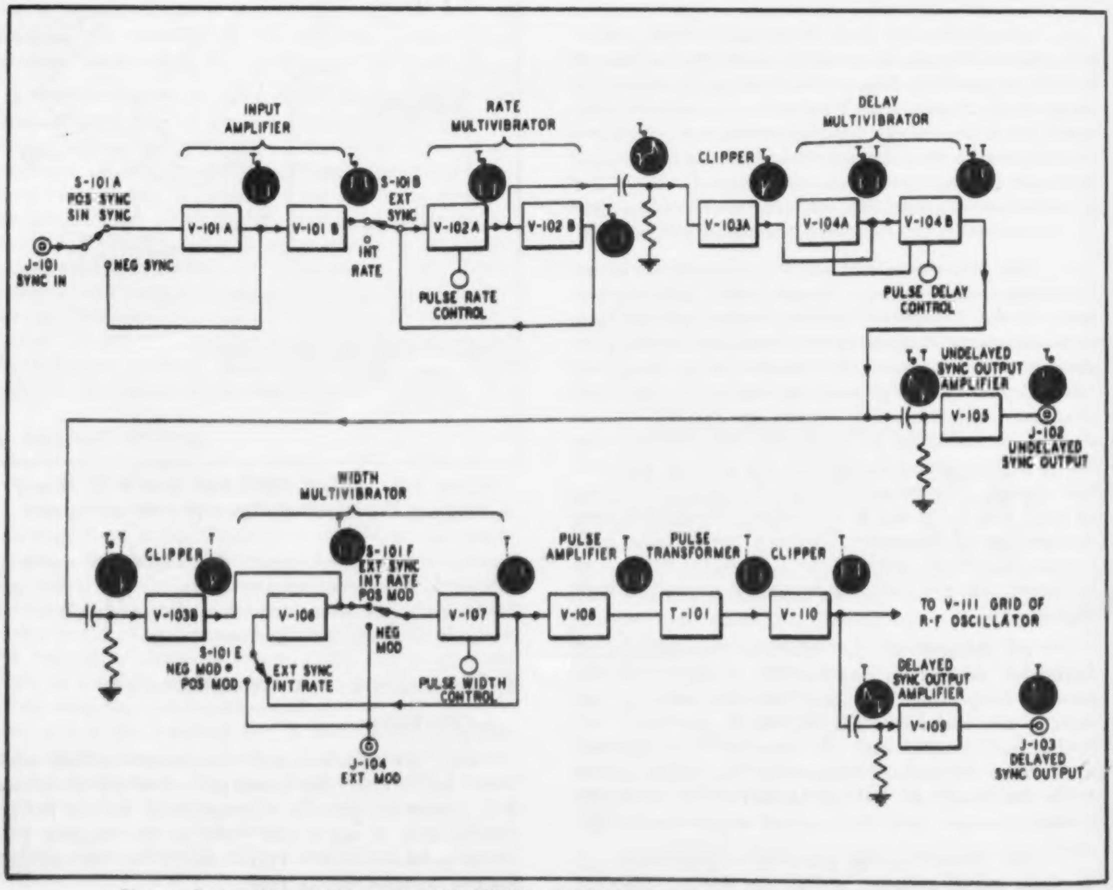

INPUT AMPLIFIER
RATE MULTIVIBRATOR
DELAY MULTIVIBRATOR
S-101A
POS SYNC
SIN SYNC
J-101
SYNC IN
NEG SYNC
V-101 A
V-101 B
S-101B
EXT SYNC
INT RATE
V-102A
V-102 B
PULSE RATE CONTROL
CLIPPER
V-103A
V-104A
V-104 B
PULSE DELAY CONTROL
UNDELAYED SYNC OUTPUT AMPLIFIER
V-105
J-102
UNDELAYED SYNC OUTPUT
WIDTH MULTIVIBRATOR
CLIPPER
V-103B
V-106
S-101 F
EXT SYNC
INT RATE
POS MOD
NEG MOD
S-101 E
NEG MOD
POS MOD
EXT SYNC
INT RATE
V-107
PULSE WIDTH CONTROL
J-104
EXT MOD
PULSE AMPLIFIER
V-108
PULSE TRANSFORMER
T-101
CLIPPER
V-110
TO V-111 GRID OF R-F OSCILLATOR
DELAYED SYNC OUTPUT AMPLIFIER
V-109
J-103
DELAYED SYNC OUTPUT
T_0
T
T_0 T

Figure 3-4. Signal Generator TS-419/U, Modulator and Synchronizer, Block Diagram

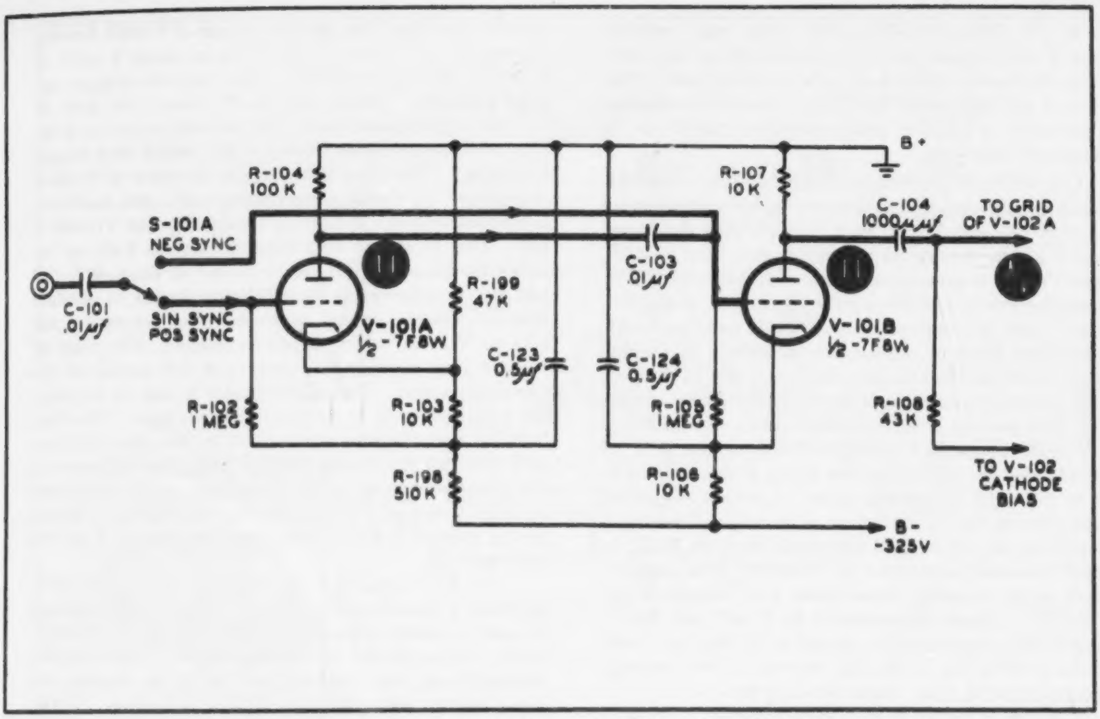


Figure 3-5. Signal Generator TS-419/U, Input Amplifier, Simplified Schematic Diagram

interval between T_0 and T is determined by the duration of the pulse generated by the delay multivibrator V-104.

(5) The negative pip occurring at time T is then applied to and triggers the signal width multivibrator, V-106 and V-107, which generates a large positive pulse that is adjustable in duration over a range from 0.5 to 10 microseconds. This positive pulse is applied to the grid of the beam power tube V-108 resulting in a strong negative pulse in the primary of pulse transformer T-101. The stepped-up positive pulse from the secondary of the transformer is limited at a pre-determined level by the clipper V-110 and then applied to the focusing grid of the reflex klystron V-111, allowing oscillation for the duration of the pulse.

b. INPUT AMPLIFIER.—The input amplifier (figure 3-5) is used only when the modulator is to be synchronized to an external source of sine waves or pulses.

(1) SINE WAVE SYNCHRONIZATION.—When the external source provides sine wave signals, they are fed through switch S-101A to the grid of the amplifier tube, V-101A. This tube is nearly cut off by virtue of the bias supplied to its control grid from the voltage divider R-198, R-103, and R-199, which also serves to keep the plate voltage low, providing a sharp cut-off characteristic. Thus, the tube acts as a clipper and creates negative pulses in its plate circuit which are passed to the grid of V-101B. Normally, V-101B draws heavy plate current since zero grid bias is applied. The plate current of V-101B is cut off by the negative pulses from V-101A, resulting in positive pulses across R-107. These pulses are differentiated by C-104 and R-108 and the positive pip occurring at the leading edge triggers multivibrator V-102. C-123 and C-124, together with associated resistors, are decoupling filters to isolate V-101 from power supply fluctuations.

(2) POSITIVE PULSE SYNCHRONIZATION.—Positive pulses follow the same path as sine waves through V-101 and the action is identical with that described for sine waves in paragraph 5.*b.*(1), this section.

(3) NEGATIVE PULSE SYNCHRONIZATION.—Negative pulses are applied to the grid of V-101B without passing through V-101A, since they are already of the proper polarity to cut off V-101B. The remainder of the action is similar to that described for sine waves in paragraph 5.*b.*(1), this section.

c. RATE MULTIVIBRATOR.—The rate multivibrator V-102 (figure 3-6) is operated either as a one-shot multivibrator when it is to be synchronized by the output of the input amplifier V-101, or as a free-running multivibrator when the pulse repetition rate is to be determined internally.

(1) SYNCHRONIZED OPERATION.—Initially, V-102A is not conducting, since the grid is returned by way of R-108 and S-101C to a negative bias developed across R-174 by the flow of cathode current from V-102B. When V-102A is drawn into a state of conduction, due to the application of a positive pulse on its grid, a negative output pulse is developed across plate resistor R-111. This output pulse is applied simultaneously to the RC circuit, C-107 and R-114, and through C-108 to the grid of the normally conducting tube V-102B, thereby cutting it off. The positive pulse resulting at plate resistor R-113 of V-102B is coupled through C-106 to the grid of V-102A, thereby enhancing the firing action originally due to the input triggering pulse. A return triggering action restores the multivibrator to its original condition when C-108 has discharged sufficiently through R-112 to permit renewed conduction in V-102B. The negative output pulse occurring across plate load resistor R-111 of V-102A is then differentiated by C-107 and R-114. The resulting negative pip is passed by V-103A to V-104, but the positive pip is blocked, because of the too-high cathode potential with respect to its plate.

(2) FREE-RUNNING OPERATION. — During free-running operation, the grid of V-102A is returned to the cathode through R-108, S-101C, R-109, and R-110. When power is applied, V-102B tends to draw a heavy plate current, causing a drop across R-113 which is passed to the grid of V-102A through capacitor C-106. V-102A is cut off and its plate voltage rises. This increase is passed back to the grid of V-102B through C-108, thereby enhancing the firing action. When the charge leaks off C-106 through R-108, R-109, and R-110, V-102A begins to conduct, its plate voltage drops, and this charge is passed by C-108 to the grid of V-102B, thereby cutting it off and causing its plate voltage to rise. This rise is passed back to the grid of V-102A through C-106, thereby reinforcing the firing action; however, C-108 is soon discharged by R-112, and V-102B again begins to conduct. The cycle then repeats after a time interval determined by the sum of the time constants due to C-108 and R-112 and C-106 and R-108, R-109, and R-110. The pulse repetition rate is varied by changing R-110 and the range is changed further by connecting C-105 in parallel with C-106 by means of S-101B. The longer the time constant (as by increasing either R or C) the longer the cycle takes and consequently, the fewer the cycles that occur each second and the lower the repetition rate.

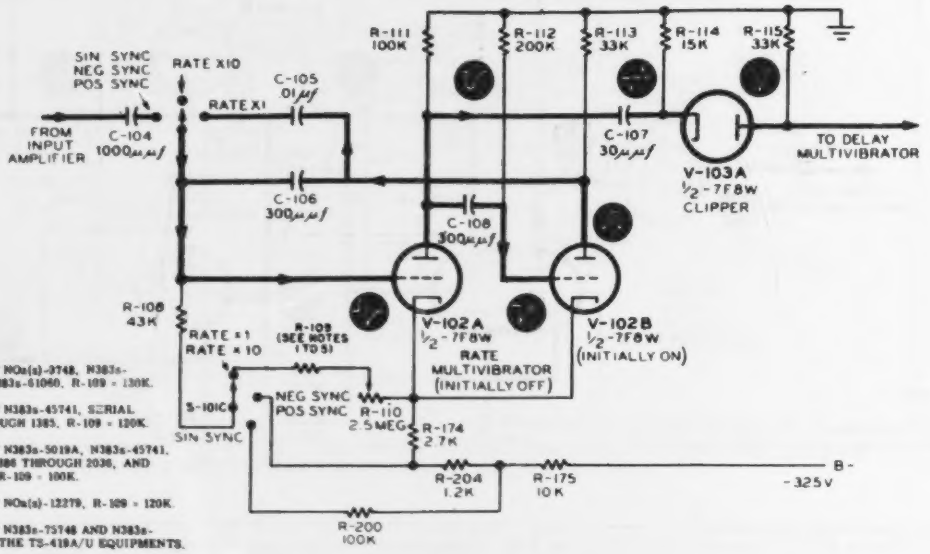
d. DELAY MULTIVIBRATOR AND UNDELAYED SYNC OUTPUT. *(See figure 3-7.)*

(1) The pulse delay multivibrator is triggered by the negative pip occurring at time T_0 and passes by V-103A as described in paragraph 5.*c.*(1), this section. The grid of V-104B is returned directly to its cathode through R-117 and R-118 so that zero bias exists and V-104B conducts. The cathode current of V-104B flowing through R-116 creates sufficient bias to retain V-104A in a non-conducting condition. The negative trigger applied through V-103A and C-109 drives the grid of V-104B negative and causes the cathode current to drop, thus removing the bias from V-103A, which then begins to conduct. The drop in voltage at the plate of V-103A reinforces the original trigger action and a new condition is reached wherein V-104A is conducting and V-104B is not. This condition lasts until the charge built up on C-109 by the original transition leaks off through R-117 and R-118, whereupon V-104B again begins to conduct and its cathode current increases—thus increasing the bias on V-104A, which ceases to conduct. The plate of V-104A goes positive as a result and this reinforces the transition action. The multivibrator is now in its original state and ready to receive another trigger. The time between transitions is determined by the time constant of C-109 and R-117 and R-118. This time difference is the delay introduced by the circuit and can be controlled by adjustment of R-118—the higher resistance values giving greater delays. The range of delay is 3 to 300 microseconds.

(2) The output is taken from the plate of V-104B, at which a positive pulse appears. This is differentiated in early models of the TS-419/U (Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651) by C-112 feeding the pulse width multivibrator. Under Contracts N383s-5019A, N383s-47541, and N383s-67816, differentiation is by C-132 feeding R-196. In either case the positive pip occurring at the leading edge is shorted out by clipper V-103B so that only the trailing or delayed edge of the delay pulse is effective in triggering the pulse width multivibrator.

(3) The undelayed sync output amplifier is also fed from the plate of V-104B by way of differentiating network C-110 and R-120. The positive pip appearing at the leading or undelayed edge of the delay pulse occurring as a result of this differentiation is amplified by V-105 and appears as the undelayed sync output pulse at the cathode of V-105. The negative pip occurring at the trailing or delayed edge of the delay pulse is not amplified since V-105 is heavily biased by R-122 and R-197, and as a result a negative input signal produces no effect. Since V-105 is operated as a cathode follower, the output impedance for the undelayed sync output pulse appearing at J-102 is low. Refer to paragraph 2.*a.*(10) of section V for information concerning the characteristics of this pulse.

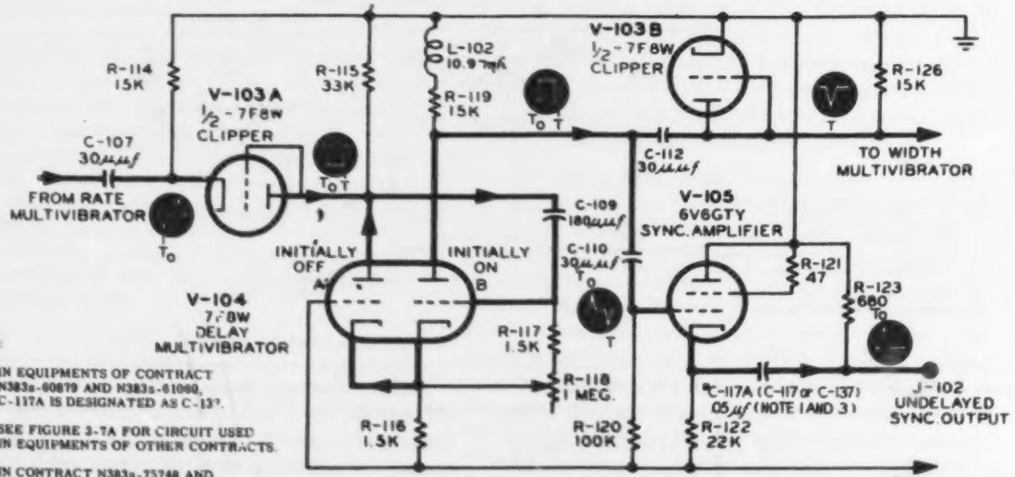
e. WIDTH MULTIVIBRATOR. *(See figure 3-8.)*—Vacuum tubes V-106 and V-107 are normally connected as a multivibrator to determine the width of the pulses which are to modulate the klystron V-111. These same tubes may also be connected as either a one- or two-stage video amplifier when it is desired to retain the width characteristics of an externally supplied negative or positive modulating pulse. The changeover is made automatically when the SELECTOR SWITCH S-101 is set to NEG MOD or POS MOD. For the characteristics required of external pulses, refer to paragraph 2.*a.*(8) of Section V.


SIN SYNC
NEG SYNC
POS SYNC
RATE X10
RATE X1
C-105
.01μf
FROM
INPUT
AMPLIFIER
C-104
1000μμf
C-106
300μμf
R-111
100K
R-112
200K
R-113
33K
R-114
15K
R-115
33K
C-107
30μμf
V-103A
½-7F8W
CLIPPER
TO DELAY
MULTIVIBRATOR
C-108
300μμf
R-108
43K
RATE ×1
RATE × 10
R-109
(SEE NOTES
1 TO 5)
V-102A
½-7F8W
RATE
MULTIVIBRATOR
(INITIALLY OFF)
V-102B
½-7F8W
(INITIALLY ON)
S-101C
NEG SYNC
POS SYNC
SIN SYNC
R-110
2.5MEG
R-174
2.7K
R-204
1.2K
R-175
10K
B-
-325V
R-200
100K

NOTES:

1. IN CONTRACT NOa(s)-9748, N383s-60879, AND N383s-61060, R-109 = 130K.
2. IN CONTRACT N383s-45741, SERIAL NO. 899 THROUGH 1385, R-109 = 120K.
3. IN CONTRACT N383s-5019A, N383s-45741, SERIAL NO. 1386 THROUGH 2036, AND N383s-67816, R-109 = 100K.
4. IN CONTRACT NOa(s)-12279, R-109 = 120K.
5. IN CONTRACT N383s-75748 AND N383s-77651, AND IN THE TS-419A/U EQUIPMENTS, R-109 = 130K.

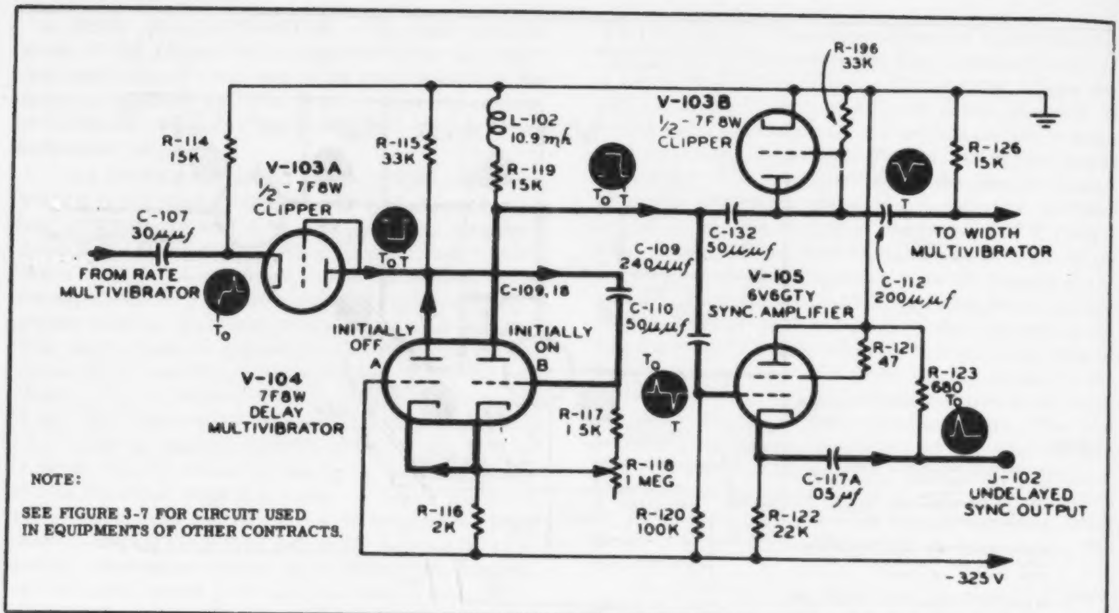
Figure 3-6. Signal Generator TS-419/U, Rate Multivibrator, Simplified Schematic Diagram


R-114
15K
V-103A
½-7F8W
CLIPPER
C-107
30μμf
FROM RATE
MULTIVIBRATOR
T₀
T₀T
R-115
33K
L-102
10.9 mh
R-119
15K
T₀ T
V-103B
½-7F8W
CLIPPER
T
R-126
15K
TO WIDTH
MULTIVIBRATOR
C-112
30μμf
C-109
180μμf
C-110
30μμf
T₀
T
V-105
6V6GTY
SYNC. AMPLIFIER
INITIALLY
OFF
A
INITIALLY
ON
B
V-104
7F8W
DELAY
MULTIVIBRATOR
R-121
47
R-123
680
T₀
R-117
1.5K
R-118
1 MEG.
*C-117A (C-117 or C-137)
.05μf (NOTE 1 AND 3)
J-102
UNDELAYED
SYNC OUTPUT
R-116
1.5K
R-120
100K
R-122
22K
-325 V

NOTES:

1. IN EQUIPMENTS OF CONTRACT N383s-60879 AND N383s-61060, C-117A IS DESIGNATED AS C-137.
2. SEE FIGURE 3-7A FOR CIRCUIT USED IN EQUIPMENTS OF OTHER CONTRACTS.
3. IN CONTRACT N383s-75748 AND N383s-77651, AND IN THE TS-419A/U EQUIPMENTS, C-117A IS DESIGNATED AS C-117.

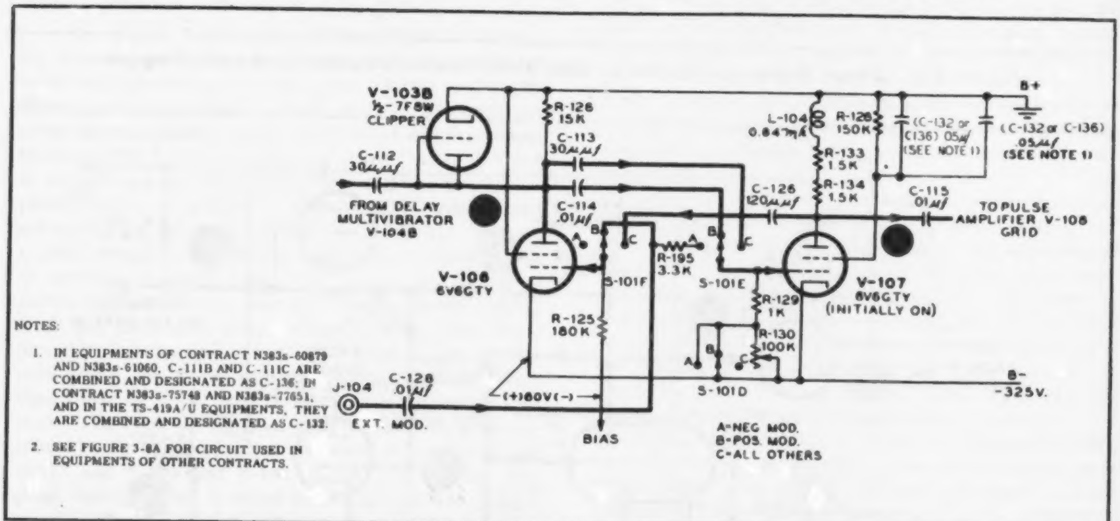
Figure 3-7. Signal Generator, Delay Multivibrator and Undelayed Sync Output Amplifier, Simplified Schematic Diagram (Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651) and TS-419A/U Equipments


R-196
33K
V-103B
½ - 7F8W
CLIPPER
R-114
15K
R-115
33K
L-102
10.9 mh
R-119
15K
R-126
15K
V-103A
½ - 7F8W
CLIPPER
T₀ T
T
C-107
30μμf
C-132
50μμf
TO WIDTH
MULTIVIBRATOR
FROM RATE
MULTIVIBRATOR
T₀T
C-109
240μμf
C-109, 18
V-105
6V6GTY
SYNC. AMPLIFIER
C-112
200μμf
T₀
C-110
50μμf
INITIALLY
OFF
A
INITIALLY
ON
B
T₀
R-121
47
R-123
680
T₀
V-104
7F8W
DELAY
MULTIVIBRATOR
R-117
1.5K
T
R-118
1 MEG
C-117A
.05μf
J-102
UNDELAYED
SYNC OUTPUT
R-116
2K
R-120
100K
R-122
22K
-325 V

NOTE:

SEE FIGURE 3-7 FOR CIRCUIT USED IN EQUIPMENTS OF OTHER CONTRACTS.

Figure 3-7A. Signal Generator TS-419/U, Delay Multivibrator and Undelayed Sync Output Amplifier, Simplified Schematic Diagram (Contracts N383s-5019A, N383s-45741, and N383s-67816)

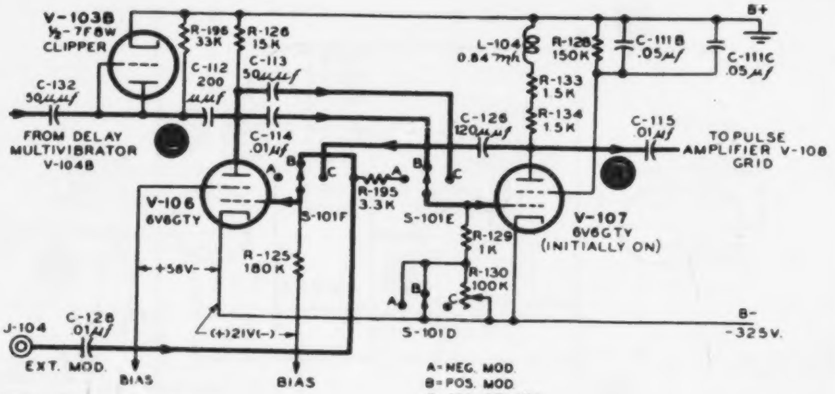

V-103B
½-7F8W
CLIPPER
R-126
15K
L-104
0.84 mh
R-128
150K
(C-132 or
C136) .05μf
(SEE NOTE 1)
B+
(C-132 or C-136)
.05μf
(SEE NOTE 1)
C-113
30μμf
R-133
1.5K
C-112
30μμf
C-126
120μμf
R-134
1.5K
C-115
.01μf
FROM DELAY
MULTIVIBRATOR
V-104B
C-114
.01μf
TO PULSE
AMPLIFIER V-108
GRID
A
B
C
R-195
3.3K
B
C
V-106
6V6GTY
S-101F
S-101E
R-129
1K
V-107
6V6GTY
(INITIALLY ON)
R-125
180K
R-130
100K
A
B
C
J-104
C-128
.01μf
(+)180V(-)
S-101D
B-
-325V.
EXT. MOD.
BIAS
A-NEG MOD.
B-POS. MOD.
C-ALL OTHERS

NOTES:

1. IN EQUIPMENTS OF CONTRACT N383s-60879 AND N383s-61060, C-111B AND C-111C ARE COMBINED AND DESIGNATED AS C-136; IN CONTRACT N383s-75748 AND N383s-77651, AND IN THE TS-419A/U EQUIPMENTS, THEY ARE COMBINED AND DESIGNATED AS C-132.
2. SEE FIGURE 3-8A FOR CIRCUIT USED IN EQUIPMENTS OF OTHER CONTRACTS.

Figure 3-8. Signal Generator, Pulse Width Multivibrator, Simplified Schematic Diagram (Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748 and N383s-77651) and TS-419A/U Equipments

(1) MULTIVIBRATOR OPERATION.—Initially V-106 is cut off by a source of fixed bias, while V-107, having its grid returned to its cathode through R-129 and R-130, has zero bias and therefore is conducting. A negative trigger is obtained from the delay multivibrator as described in paragraph 5.*d.*, this section, and is conducted through C-113 and S-101E (set to position C) to the grid of V-107, thus cutting it off. The consequent rise in the plate voltage of V-107 is fed back to the grid of V-106 through C-126 and S-101F, thus overcoming the fixed bias of V-106. As a result, the plate voltage of V-106 drops and reinforces the original triggering action. When the charge built up on C-113 by the initial transition leaks off sufficiently, V-107 again begins to conduct, and its plate voltage falls and cuts off V-106, whose plate voltage in turn rises, thus reinforcing the transition action. The time between transitions is determined by the time constant of C-113 and R-129 and


V-103B
½-7F8W
CLIPPER
R-196
33K
R-126
15K
C-112
200
μμf
C-113
50μμf
C-132
50μμf
FROM DELAY
MULTIVIBRATOR
V-104B
C-114
.01μf
L-104
0.84 mh
R-128
150K
C-111B
.05μf
C-111C
.05μf
B+
R-133
1.5K
R-134
1.5K
C-126
120μμf
C-115
.01μf
TO PULSE
AMPLIFIER V-108
GRID
A
B
C
R-195
3.3K
V-106
6V6GTY
S-101F
S-101E
V-107
6V6GTY
(INITIALLY ON)
R-129
1K
R-130
100K
R-125
180K
+58V-
(+)21V(-)
J-104
C-128
.01μf
EXT. MOD.
BIAS
BIAS
S-101D
B-
-325V.
A=NEG. MOD.
B=POS. MOD.
C=ALL OTHERS

NOTE:

SEE FIGURE 3-8 FOR CIRCUIT USED IN EQUIPMENTS OF OTHER CONTRACTS.

Figure 3-8A. Signal Generator TS-419/U, Pulse Width Multivibrator Simplified Schematic Diagram (Contracts N383s-5019A, N383s-45741, and N383s-67816)

R-130. This time difference determines the width of the modulating pulse, which is variable by adjustment of R-130 over a range of 0.5 to 10 microseconds. A positive output pulse is taken from the plate of V-107 to feed the pulse amplifier V-108.

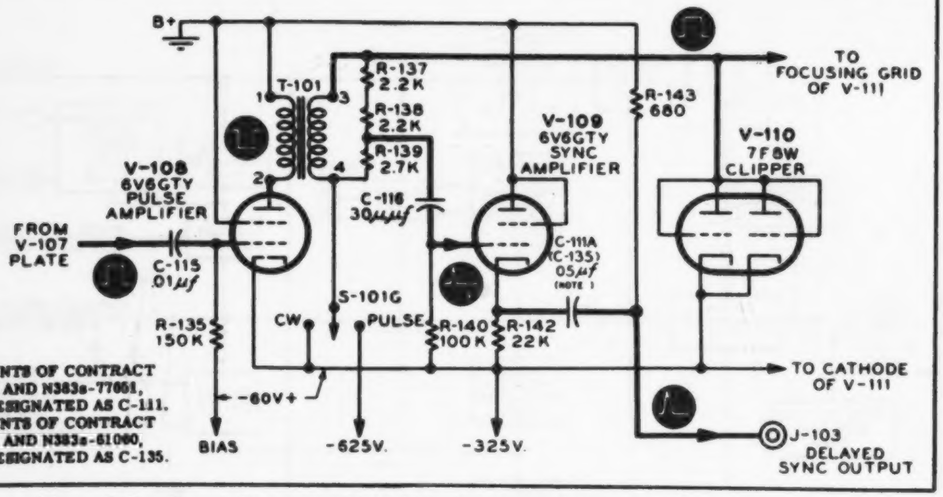
(2) POS MOD OPERATION.—Tubes V-106 and V-107 become a two-stage video amplifier when external positive pulses are used directly to modulate the klystron. By means of S-101F (position B) the grid of V-106 is disconnected from feed back capacitor C-126 and tied to the EXT MOD connector J-104 through C-128. The grid of V-107 is fed from the plate of V-106 by C-114 through S-101E (position B) and R-130 is shorted out by S-101D (position B). These changes are required to provide suitable and fixed time constants in the interstage coupling network. The output is taken from the plate of V-107. A positive input pulse overcomes the cut-off bias on V-106, causing plate current flow, and creates a negative pulse at the plate of V-106, thereby cutting off V-107 and causing a positive pulse to appear in the plate circuit of V-107. This pulse is used to drive the pulse amplifier V-108.

(3) NEG MOD OPERATION.—When external negative pulses are to be used directly to modulate the klystron, only V-107 is used. By means of S-101E (position A) the grid of V-107 is connected to the voltage divider consisting of R-195 and R-129. R-130 is shorted out by S-101D. This voltage divider is fed from the EXT MOD connector J-104 through C-128. Attenuation of the negative pulses by the voltage divider is necessary to prevent widening of high-amplitude negative pulses. An incoming negative pulse cuts off V-107, causing a positive pulse to appear in its plate circuit. This pulse is used to drive pulse amplifier V-108.

f. PULSE AMPLIFIER AND DELAYED SYNC OUTPUT. *(See figure 3-9.)*

(1) PULSE AMPLIFIER.—In all cases described previously, a positive-going pulse was supplied by V-107 to the grid of V-108, which is normally biased beyond cut-off. The positive potential thus impressed on the grid of V-108 causes the tube to draw heavy plate current through the primary of pulse transformer T-101. The resulting negative pulse across the primary of T-101 is stepped up in voltage and inverted in polarity in the secondary. The resulting positive-going output pulse is clipped by the action of V-110, and is applied to the focusing grid of the reflex klystron V-111, causing V-111 to oscillate for the duration of the pulse.

(2) DELAYED SYNC OUTPUT.—A pulse voltage is picked off the network R-137, R-138, and R-139 connected across the output of T-101. This pulse is differentiated by C-116 and R-140. The positive pip occurring at the leading edge of the pulse overcomes the large bias on V-109 created by cathode resistor R-142, and V-109 conducts with a heavy cathode current. The negative pip occurring at the trailing edge of the output pulse has no effect on V-109. It should be noted that the positive pip impressed on the grid corresponds with the trailing edge of the output from the delay multivibrator V-104. Furthermore, it occurs at substantially the same time as the beginning of the r-f pulse. Thus, V-109 acts to provide a low-impedance output source for a positive video pulse at the DELAYED SYNC OUTPUT connector J-103 and also clips any negative portion of the pulse. For output pulse characteristics refer to paragraph 2.*a.*(10) of Section V.



NOTE:

IN EQUIPMENTS OF CONTRACT N383s-75748 AND N383s-77651, C-111A IS DESIGNATED AS C-111. IN EQUIPMENTS OF CONTRACT N383s-60879 AND N383s-61060, C-111A IS DESIGNATED AS C-135.

Figure 3-9. Signal Generator TS-419/U, Pulse Amplifier and Delayed Sync Amplifier, Simplified Schematic Diagram

6. POWER SUPPLY. *(See figures 3-10, 7-1, 7-1A, and 7-1B.)*

a. With the power cable connected and POWER OFF ON switch S-102 in the OFF position (white pilot light I-101 on front panel energized), input power is applied to the internal space heaters R-161, R-162, and R-192, to maintain the instrument slightly above ambient temperature. The space heaters are physically located on the underside of the chassis, in three corners. (See figure 5-3.)

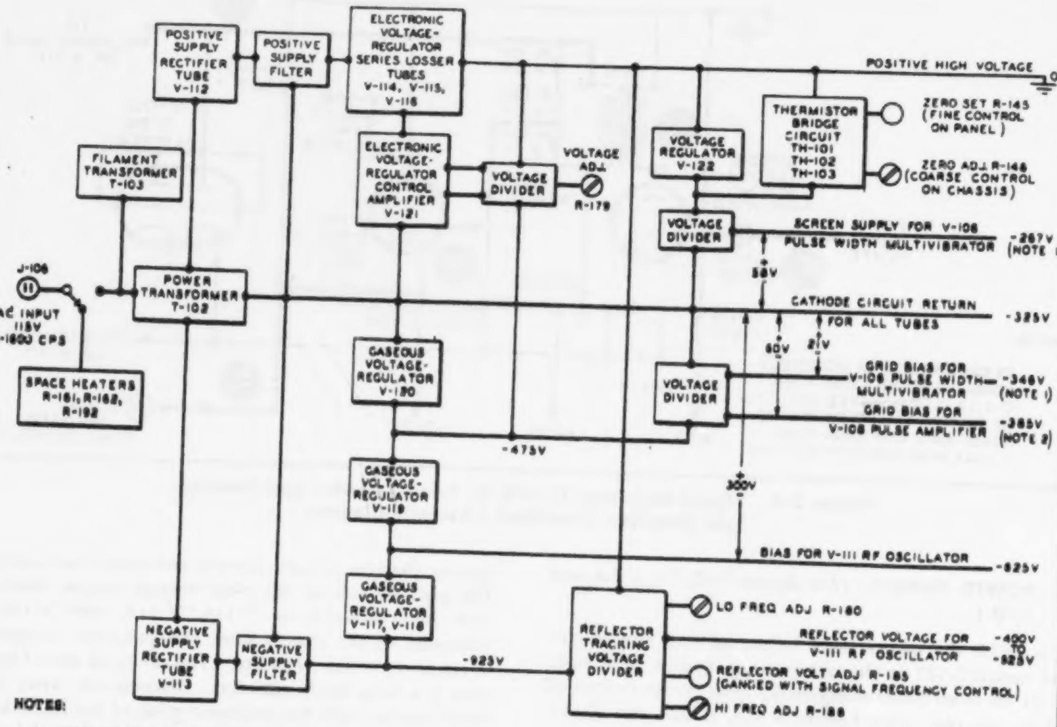
Note

Disconnect Power Cable CX-337/U (for TS-419/U) or Power Cable Assembly CX-3135/U (for TS-419A/U) from the POWER INPUT jack, to make the equipment entirely inactive.

With the power cable connected and POWER OFF ON switch S-102 in the ON position (red pilot light I-102 on the front panel energized) the space heaters are deenergized and power is applied to Signal Generator TS-419/U. Input power is applied to the filament transformer T-103, which supplies filament voltage to all tubes, and to power transformer T-102. High voltage for the plate voltage rectifier V-112 and the bias rectifier V-113 is supplied by power transformer T-102.

b. Positive plate voltage from full-wave rectifier V-112 is filterd by L-101 and C-120 and regulated by a parallel bank of three voltage losser tubes. The losser tubes V-114, V-115, and V-116 are controlled by V-121 operated in a cascode arrangement, that is, an arrangement having the gain of a cascade amplifier and the phase reversal of a single-stage amplifier. This series-losser–cascode control tube combination stabilizes the plate voltage supply against changes in load current and input line voltage. The positive side of the plate voltage output obtained from the cathodes of V-114, V-115, and V-116 is grounded to the chassis since this potential is applied to the body of the r-f cavity. The cavity of the r-f oscillator is a large metal structure. Because the cavity is in direct contact with the resonator grids of the reflex klystron V-111 and must be at a high positive potential relative to the cathode of the tube, the cavity and the B-plus supply are grounded and B-minus is approximately 325 volts negative with respect to ground. In equipments manufactured under Contract N383s-5019A, TY-101 and TY-102 are connected across the series losser tubes, V-114, V-115, and V-116, to prevent tube flashover and consequent breakdown of electrolytic capacitors during initial tube warm-up.

c. Bias voltage from V-113 is filtered by C-121, R-149, R-150, R-171, R-190, R-193, and R-194 and regulated by the group of series voltage regulator tubes V-117 toV-120 inclusive. The positive potential end of this group of regulator tubes is connected to the positive potential return of the bias voltage supply, which is common with the negative potential return of the plate voltage supply. A voltage divider R-172 and R-173 connected across V-120 supplies negative bias to the pulse amplifier V-108 and, in Contracts NOa(s)-9748, -12279, -60879, N383s-61060, -75748, -77651, and in the TS-419A/U equipments, to V-106 of the width multivibrator. Under Contracts N383s-5019A, N383s-45741, and -67816, an additional voltage divider (R-132 and R-203) supplies grid bias to V-106, while screen bias is obtained from the junction of R-148 and R-191. The voltage across V-120 also goes to a voltage divider consisting of R-179, R-178, R-177, and R-176, which connects to the grounded posi-


POSITIVE SUPPLY RECTIFIER TUBE V-112
POSITIVE SUPPLY FILTER
ELECTRONIC VOLTAGE-REGULATOR SERIES LOSSER TUBES V-114, V-115, V-116
POSITIVE HIGH VOLTAGE
0V
THERMISTOR BRIDGE CIRCUIT TH-101 TH-102 TH-103
ZERO SET R-145 (FINE CONTROL ON PANEL)
ZERO ADJ. R-146 (COARSE CONTROL ON CHASSIS)
VOLTAGE REGULATOR V-122
FILAMENT TRANSFORMER T-103
ELECTRONIC VOLTAGE-REGULATOR CONTROL AMPLIFIER V-121
VOLTAGE DIVIDER
VOLTAGE ADJ.
R-179
VOLTAGE DIVIDER
SCREEN SUPPLY FOR V-106 PULSE WIDTH MULTIVIBRATOR
-267V (NOTE 1)
58V
J-106
AC INPUT 115V 50-1600 CPS
POWER TRANSFORMER T-102
CATHODE CIRCUIT RETURN FOR ALL TUBES
-325V
60V
21V
SPACE HEATERS R-161, R-168, R-192
GASEOUS VOLTAGE-REGULATOR V-120
VOLTAGE DIVIDER
GRID BIAS FOR V-106 PULSE WIDTH MULTIVIBRATOR
-346V (NOTE 1)
GRID BIAS FOR V-108 PULSE AMPLIFIER
-385V (NOTE 2)
-475V
300V
GASEOUS VOLTAGE-REGULATOR V-119
BIAS FOR V-111 RF OSCILLATOR
-825V
GASEOUS VOLTAGE-REGULATOR V-117, V-118
REFLECTOR TRACKING VOLTAGE DIVIDER
LO FREQ ADJ R-180
REFLECTOR VOLTAGE FOR V-111 RF OSCILLATOR
-400V TO -825V
REFLECTOR VOLT ADJ R-185 (GANGED WITH SIGNAL FREQUENCY CONTROL)
HI FREQ ADJ R-188
NEGATIVE SUPPLY RECTIFIER TUBE V-113
NEGATIVE SUPPLY FILTER
-925V

NOTES:

1. USED ONLY IN CONTRACT N383s-5019A, N383s-45741, AND N383s-67616.
2. FOR CONTRACT NOs(a)-9748, NOu(a)-12279, N383s-60679, N383s-61060, N383s-75748, N383s-77581, AND TS-419A/U EQUIPMENTS, THIS VOLTAGE ALSO USED AS GRID BIAS FOR PULSE WIDTH MULTIVIBRATOR V-106.

Figure 3-10. Signal Generator TS-419/U, Power Supply, Block Diagram

tive potential side of the plate supply. This divider supplies control voltage to the grids of the control tube V-121. The plate supply voltage can be adjusted by means of VOLTAGE ADJ R-179, located on top of the chassis. Bias for the r-f oscillator V-111 is obtained from the junction of voltage regulators V-118 and V-119.

d. Reflector voltage for the r-f oscillator V-111 is obtained from a voltage divider connected from the cathode of V-117 to the grounded positive side of the plate voltage supply. This divider is composed of the HI. FREQ. ADJ. variable resistor R-188, reflector tracking voltage variable resistor R-185 (shunted by R-186 and R-187), R-184, R-183, R-182, R-181, and the LO. FREQ. ADJ. variable resistor R-180, all connected in series. Reflector voltage obtained from the junction of R-185 and R-184 is passed through a ripple-frequency filter composed of R-159, C-119B, R-158, and C-119A and through a radio-frequency filter Z-104.

e. Direct current supply for the thermistor bridge in the power monitor is obtained from the cathode of regulator tube V-122 which is connected to the negative potential side of the plate voltage supply through R-148 and R-191. Bridge current from V-122 cathode is drawn through R-147, R-146, and R-145. The functions of R-145 and R-146 are described in paragraph 4.*b.*(3) (*d*), this section.

SECTION IV

MAINTENANCE

WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted by personnel. Extreme caution should be exercised when working with the equipment. Observe all safety regulations.

Note

Throughout this handbook, all references to TS-419/U also apply to TS-419A/U, except where specifically noted. In the TS-419A/U, Power Cable Assembly CX-3135/U is used in place of Power Cable CX-337/U.

SECTION IV

MAINTENANCE

WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted by personnel. Extreme caution should be exercised when working with the equipment. Observe all safety regulations.

Note

Throughout this handbook, all references to TS-419/U also apply to TS-419A/U, except where specifically noted. In the TS-419A/U, Power Cable Assembly CX-3135/U is used in place of Power Cable CX-337/U.

1. GENERAL.

a. This section contains information required for preventive and corrective maintenance of Signal Generator TS-419/U. Included are inspections and checks necessary to maintain continuity of service, trouble-shooting procedures, an alignment and test data.

b. The material contained in this section should be used in conjunction with the schematic and wiring diagrams, figures 7-1, 7-1A, 7-1B, 7-1C, 7-2, 7-2A, 7-2B, 7-2C, 7-2D, 7-3, 7-3A, 7-3B, and 7-3C.

2. PREVENTIVE MAINTENANCE.

a. GENERAL.—The prime function of preventive maintenance is to prevent breakdown and therefore the need for repairs. Preventive maintenance is performed at certain definite intervals, depending on the nature of the equipment and as specified by authorized personnel. The inspections outlined in paragraphs 2.*c.* and 2.*d.* of this section, should be performed by maintenance personnel at the times and intervals stated and whenever deemed necessary by the authority responsible for the proper functioning of the equipment.

b. ROUTINE CARE.—Reasonable care in transporting, handling, and operating Signal Generator TS-419/U will prolong its useful life and minimize service troubles. When the instrument is not in use, the power should be turned off and Power Cable CX-337/U disconnected, unless use of the space heaters is required due to excessive humidity. Insofar as practicable, Signal Generator TS-419/U should be protected from dust, moisture, and extremes of temperature. If it is not to be used for long periods, it should be placed in the transit case.

c. WEEKLY INSPECTION.—Inspect the equipment weekly as follows:

(1) Check the exterior of Signal Generator TS-419/U for dust, dirt, and corrosion.

(2) Check Power Cable CX-337/U for rubber deterioration, excessive wear, cuts, and kinks.

(3) Check all switches and controls for smooth and positive action.

(4) Check functioning of HEATER and POWER indicator lamps.

(5) Check condition of accessory cables and supply of accessory component spares.

d. 500-HOUR INSPECTION.—After 500 hours of operation, or sooner if warranted, perform the following inspections:

(1) Loosen the eight captive screws on the front panel and the two on the back of the instrument case. Slide the chassis out of the instrument case.

(2) Inspect all detailed parts for blistering or other signs of excessive heating.

(3) Check that all tubes are firmly seated in the sockets and that tube locks are closed.

(4) Check all control knobs and switches for smooth and positive action and security.

(5) Examine all large screw-mounted detailed parts for security.

(6) Inspect the entire unit for accumulation of dust, dirt, or corrosion, particularly in the recesses and crevices. Remove any accumulation with a dry cloth or, if necessary, with a cloth dampened with carbon tetrachloride (Federal Stock Catalog No. SI-C-775 for a one-gallon can).

CAUTION

Do not attempt to clean the exterior of silver-plated surfaces of the r-f assembly since solvents may remove the protective lacquer which has been applied to prevent corrosion.

(7) Replace the unit in the instrument case and perform the operation procedures outlined in paragraphs 5. and 6. of Section II. If the equipment fails to function properly, refer to paragraph 3. of this section.

TABLE 4-1. LUBRICATION CHART

Major Assembly	*Part*	*Type of Lubricant**	*Quantity of Lubricant*	*Lubrication Period*	*Procedure*
R-f assembly	Gears	Light oil	Six drops per gear	2 years	Remove r-f assembly
	Nut, H-105	Grease	Pack balls	2 years	Remove nut
	Hubs, H-116 and H-117	Grease	Light film	2 years	Remove r-f assembly
	Rack and pinion gears, O-108 and O-109	Grease	Light film	2 years	Remove chassis only
	Tumbler Assembly, H-119	Grease	Light film	2 years	Disassemble tumbler assembly
	Shaft bearings	Grease	Light film	2 years	Remove shafts
Cavity	Tuning worm shaft, O-101	Grease	Light film	2 years	Disassemble cavity
	Bearing races, H-157	Grease	Pack balls	2 years	Disassemble cavity
Signal Generator TS-419/U	Instrument case threaded inserts	Grease	Light film	2 years	Remove chasis

**Type of Lubricant*	*Manufacturer's Type*	*AN Specification*
Light oil	Eclipse Pioneer PO-10	AN-O-11
Grease	Esso Beacon #325	AN-G-25

e. LUBRICATION.—Signal Generator TS-419/U is completely lubricated at the factory and should require additional lubrication at intervals of approximately one year, unless operating terrain is of such nature as to require more frequent lubrication. Lubrication data are given in table 4-1.

3. CORRECTIVE MAINTENANCE.

a. GENERAL.—When the equipment fails to function properly, the trouble may be corrected by mechanical or electrical adjustment, or, if necessary, by replacement of one or more defective parts. Care must be exercised during all repair procedures; otherwise, additional troubles may be introduced. Special attention must be paid to physical positioning of wiring and detailed parts since a change in position may affect the operation of the equipment. None of the adjustments or tests described in this section should be undertaken unless the symptoms noted indicate that the particular section of the equipment or the particular series of adjustments requires such attention.

b. LOCALIZING TROUBLE.—The first step in correcting any trouble or failure is to isolate the section of the circuit causing the trouble. Such isolation can be best accomplished by considering the circuit as composed of the basic sections shown in figures 3-1 and 3-4. Trouble ordinarily occurs in only one section at a time. After narrowing the trouble down to a specific section, the next step is to determine the tube circuit involved. Check the circuit visually for any obviously defective detailed parts. Localization may be aided through waveform comparison. Figures 7-1, and 7-1A, B, C show waveforms observed at certain points of the circuit during normal operation. In general, if the correct waveform is found to exist at the input of the stage but is incorrect at the output of the same stage, a replacement tube should be installed before attempting further tests. If the trouble is not corrected through tube replacement, always replace the tube originally removed in order to eliminate the need for recalibration of the instrument. If no defective tubes are found, voltage and resistance measurements should be made. Nominal values of voltage and resistance measurements from tube socket terminals to ground are listed in tables 4-5 and 4-6. In addition, normal voltage and resistance readings are shown in figure 7-4. As an aid in servicing the equipment, a trouble-shooting chart (table 4-2) is included. Table 4-2 lists the symptoms of possible troubles in the order in which they would probably be observed according to the sequence of operation described in paragraph 6. of Section II.

TABLE 4-2. TROUBLE-SHOOTING CHART

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
1. WITH THE POWER CABLE CONNECTED AND "POWER OFF ON" SWITCH "OFF," HEATER LAMP I-101 DOES NOT LIGHT.	No primary a-c power.	Check source of power.
	Power cable defective.	Repair or replace power cable.
	Fuse F-101 and/or F-102 defective.	Replace F-101 and/or F-102.
	Heater lamp I-101 open.	Replace I-101.
2. WITH THE POWER CABLE CONNECTED AND "POWER OFF ON" SWITCH "ON," POWER LAMP I-102 DOES NOT LIGHT.	No primary a-c power.	Check source of power.
	Power cable defective.	Repair or replace power cable.
	Fuse F-101 and/or F-102 defective.	Replace F-101 and/or F-102.
	Power lamp I-102 open.	Replace I-102.
	Filament transformer T-103 defective.	Check continuity and resistance value of windings of T-103 with Multimeter TS-352/U (alternate, Simpson Model 260), with all tubes removed from their sockets. (Refer to table 4-7.) Replace T-103 only after careful tests prove it is defective.
3. SOME FILAMENTS LIGHT, OTHERS DO NOT.	Broken filament lead.	Remove all tubes and check wire continuity with Multimeter TS-352/U (alternate, Simpson Model 260), to determine location of fault.
	T-103 defective.	Replace T-103 only after careful tests prove it is defective. (Refer to trouble No. 2.)
4. FUSES F-101 AND F-102 BLOW REPEATEDLY AS SOON AS POWER IS APPLIED.	V-112, V-113, C-120, C-121, T-102, T-103 defective.	Remove V-112 and check if fuses F-101 and F-102 still blow. If not, check V-112 and C-120. If fuses still blow with V-112 removed, remove V-113 also. **CAUTION** Do not remove V-113 without having previously removed V-112. If, with V-112 and V-113 removed, F-101 and F-102 do not blow, test V-113 in Tube Tester I-177A and check condition of C-121. If trouble still exists, check windings and resistance of T-102 and T-103 with Multimeter TS-352/U (alternate, Simpson Model 260). (Refer to table 4-7.)

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
5. FUSES F-101 AND F-102 BLOW SOON AFTER POWER IS APPLIED.	C-122 shorted.	Replace C-122.
	V-108 defective.	Replace V-108.
	V-111 defective.	Check by removing V-111. If fuses no longer blow, replace V-111. (Refer to paragraph 6.*c*. of this section.)
	Z-101, Z-102, or Z-103 shorted.	Replace Z-101, Z-102, or Z-103.
	Lack of bias on V-108, due to bias supply failure. C-117B (designated C-138A in Contracts N383s-60879, N383s-61060, or C-133B in TS-419A/U) may be shorted.	Check that all voltage regulator tubes V-117, V-118, V-119, and V-120 are glowing. Replace if any are defective. Replace C-117 (C-138 or C-133B); refer to "probable cause."
6. FUSES F-101 AND F-102 BLOW AFTER POWER HAS BEEN APPLIED FOR SEVERAL HOURS OR MORE.	Refer to troubles No. 4 and 5. Also, defective transformer T-102 or T-103 may be probable cause, particularly if fuse blowing is not consistent.	Refer to remedies for troubles No. 4 and 5.
7. FILAMENTS LIGHT, BUT NO EVIDENCE OF PLATE VOLTAGE, i.e., NO METER READING, IRRESPECTIVE OF SETTING OF "ZERO SET" CONTROL.	V-112 defective.	Check d-c voltage, with Multimeter TS-352/U (alternate, Simpson Model 260) on pin 8 of V-112. (See figure 7-4.) If no voltage, replace V-112.
	L-101 open.	Check continuity of L-101 with Multimeter TS-352/U (alternate, Simpson Model 260). (Refer to table 4-7.) Replace if necessary.
	C-120 shorted.	Check C-120. Replace if defective.
	C-122 shorted.	Check C-122. Replace if defective.
	V-122 not seated properly or defective.	Check tube position. Check V-122 for continuity between pins 4 and 7 with Multimeter TS-352/U (alternate, Simpson Model 260) and test in Tube Tester I-177A. If open, replace V-122.
	Defective resistor(s) R-145 through R-148 and R-191.	Check resistance of R-145 through R-148 and R-191 with Multimeter TS-352/U (alternate, Simpson Model 260). (See figures 7-1, 7-1A, and 7-1B.) Replace defective resistor(s).
8. "METER" WILL NOT ZERO SET.	Incorrect plate voltage.	Check voltage from pin 7 of V-110 to ground. (See figure 7-4.) If very high, replace V-121. If very low, check C-131 and if necessary, replace V-111. (Refer to paragraph 6.*c*. of this section.) If no plate voltage, see trouble No. 7. If voltage is within 5 per cent of normal value, reset by means of R-179.

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
8. "METER" WILL NOT ZERO SET (Cont.).	V-122 defective	Check voltage from pin 7 of V-122 to ground. (See figure 7-4.) If incorrect, replace V-122.
	TH-103 open.	Check TH-103 by removing lead from Z-105 and checking continuity between terminal of Z-105 and chassis.
	Open resistor.	Check resistance of R-151 through R-157 with Multimeter TS-352/U (alternate, Simpson Model 260). (See figures 7-1, 7-1A, 7-1B, and 7-1C.) Replace if any are defective. **CAUTION** Short-circuit meter M-101 when checking these resistors.
8A. "METER" WILL NOT ZERO SET AFTER LONG PERIODS OF OPERATION.	Low plate voltage due to defective C-131.	Replace C-131.
9. METER ZERO JUMPS.	If "jump" is about one-quarter inch or less on meter scale and occurs when S-101 is switched, trouble is probably instability of V-120.	Check voltage between pins 1 and 7 of V-120. (See figure 7-4.) If a jump of one or two volts occurs as S-101 is moved or as power is alternately applied, replace V-120.
	If jump is larger than about one-quarter inch as S-101 is switched, voltage regulator is probably defective.	Test V-114, V-115, and V-116 in Tube Tester I-177A. Replace if necessary. Also refer to trouble No. 8.
	If off-scale jumps are observed, tap Z-105. If tapping produces jumps, Z-105, or TH-103, or O-106 is defective.	Check continuity of Z-105 for stability with Wheatstone Bridge. If unstable with tapping, replace. [Refer to paragraphs 10.*c*.(5) and 10.*c*.(6) of this section.] Check TH-103 for stability. If unstable with tapping, replace. [Refer to paragraphs 10.*b*.(1) and 10.*b*.(2) of this section.] Inspect soldering of L-105 to O-106. If open, resolder. Inspect security of connector in O-106 on lead of TH-103. If loose, retighten with small scriber or jeweller's screw driver.
10. NO R-F POWER INDICATED BY "METER" IN "CW" POSITION OF "SELECTOR SWITCH."	Incorrect plate voltage.	Refer to troubles No. 7 and 8.
	Incorrect reflector voltage.	Check adjustment of R-180 and R-188. Check mechanical operation and continuity of R-185; readjust or replace. Refer to paragraph 10.*d*. of this section.

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
10. NO R-F POWER INDICATED BY "METER" IN "CW" POSITION OF "SELECTOR SWITCH" (Cont.).	V-111 inoperative.	Replace V-111. Refer to paragraph 6.*c.* of this section.
	Defective thermistor mounting; loop shorted, or center contact loose.	Refer to paragraph 10.*b.* of this section.
	Open choke L-106, L-107, or L-108.*	Replace defective choke.
11. NO R-F OUTPUT AS DETECTED BY RECEIVER OR POWER METER CONNECTED TO "R-F OUTPUT" CONNECTOR, J-105.	Attenuator backed off too far.	Set attenuator at −3 dbm. Be sure drive is not slipping and set screws are tight. Refer to paragraph 8.*c.* of this section.
	Defective attenuator cable assembly.	Replace attenuator cable assembly if resistance across V-105 is not 51 ohms ±20 per cent. Refer to paragraphs 8.*c.* and 10.*e.* of this section.
12. R-F OUTPUT LOW, ERRATIC OR AT WRONG FREQUENCY.	Low plate voltage due to defective C-131.	Replace C-131.
	Reflector voltage incorrect or V-111 defective.	Refer to trouble No. 10.
	If remedies suggested in trouble No. 10 do not remedy the trouble and the output is erratic at the high-frequency end of the tuning range, inner parts of cavity subassembly are probably dirty or corroded.	Tune over any bad spots repeatedly. If trouble is not removed or alleviated after approximately 30 passes, try rotating V-111 slightly. If none of these measures, or replacement of V-111, is of any avail, replace cavity assembly A-106. (Refer to paragraph 10.*j.* of this section.)
13. R-F OUTPUT IN "ZERO SET" POSITION OF S-101.	Choke L-106 open.*	Replace L-106.
	Grid return to V-111 open.	Repair defective wiring. (See figures 7-2, 7-2A, 7-2B, 7-2C and 7-2D.)
	V-111 defective.	Replace V-111.
14. NO R-F PULSE OUTPUT AS DETECTED BY RECEIVER OR CRYSTAL DETECTOR AND OSCILLOSCOPE WITH NEGATIVE "EXT MOD" INPUT.	V-107, V-108, or V-110 defective.	Test V-107, V-108, or V-110 in Tube Tester I-177A. Replace defective tube.
	Defective pulse transformer T-101.	Check resistance of T-101 windings with Multimeter TS-352/U (alternate, Simpson Model 260). (Refer to table 4-7.) If winding is open or shorted to case, replace. Remove leads to terminals No. 1, 3, and 4 before performing this test.
	Incorrect bias on V-108.	Check C-117B (C-138A in Contracts N383s-60879, N383s-61060 or C-133B in TS-419A/U), R-172, R-173. Check voltage between pins 1 and 7 of V-120. Replace any defective component.

* L-106, L-107, and L-108 not used in Contract N383s-5019A.

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
14. NO R-F PULSE OUTPUT AS DETECTED BY RECEIVER OR CRYSTAL DETECTOR AND OSCILLOSCOPE WITH NEGATIVE "EXT MOD" INPUT (Cont.).	S-101E, S-101F, or S-101G defective.	Check continuity of switch *at switch*. Re-form contacts or replace if defective. Check for broken lead to switch.
	L-103 or L-104 open.	Check continuity of L-103 and L-104. (Refer to table 4-7.) Replace if necessary.
	C-115 or C-128 defective.	Check C-115 and C-128. Replace if necessary.
15. NO R-F PULSE OUTPUT AS DETECTED BY RECEIVER OR CRYSTAL DETECTOR AND OSCILLOSCOPE WITH POSITIVE "EXT MOD" INPUT.	Refer to trouble No. 14. If trouble still exists, V-106 is probably defective.	Test V-106 in Tube Tester I-177A and replace if defective.
	Incorrect bias on V-106.	Check voltage across pins 1 and 7 of V-122. Check R-172, R-173, R-203, C-117, 117B, 117C (designated C-138A and C138B in Contracts N383s-60879, -61060, -75748, -77651; designated C-133A and C-133B in TS-419A/U.) In equipments of Contracts N383s-5019A, -45741, and -67816, check R-132, R-148, R-191 and V-122. (See figure 7-1A.) Replace defective parts.
16. NO R-F PULSE OUTPUT AS DETECTED BY RECEIVER OR CRYSTAL DETECTOR AND OSCILLOSCOPE WITH "SELECTOR SWITCH" IN "RATE X1" OR "RATE X10" POSITION.	If dependent on setting of "PULSE WIDTH" control, V-106 is probably defective.	Replace V-106.
	If dependent on setting of "PULSE DELAY" control, V-104 is probably defective.	Replace V-104.
	If dependent on neither "PULSE WIDTH" nor "PULSE DELAY" control settings, V-102 is probably defective.	Replace V-102.
17. NO R-F PULSE OUTPUT AS DETECTED BY RECEIVER OR CRYSTAL DETECTOR AND OSCILLOSCOPE WITH "POS SYNC," "NEG SYNC," OR "SIN SYNC" INPUT.	Refer to troubles No. 14, 15, and 16. If trouble still exists, V-101 or V-102 is probably defective.	Replace V-101 or V-102.
18. NO DELAYED SYNC OUTPUT ALTHOUGH R-F PULSE OUTPUT IS OBTAINED. *(If pulse output is not obtained, refer to troubles No. 14, 15, 16, or 17.)*	V-109 defective.	Replace V-109.
19. NO UNDELAYED SYNC OUTPUT ALTHOUGH DELAYED SYNC OUTPUT AND R-F PULSE OUTPUT ARE OBTAINED.	V-105 defective.	Replace V-105.
20. R-F PULSES 10 MICROSECONDS LONG BEGIN DECAY BEFORE END OF PULSE WHEN PULSES ARE INTERNALLY GENERATED ON RATE X1 RANGE.	V-108 defective.	Replace V-108.
	T-101 defective.	Replace T-101.

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
21. EXCESSIVE NEG MOD SIGNAL REQUIRED TO SECURE FULL MODULATION. *(Also refer to troubles No. 14 and 20.)*	V-107 defective.	Replace V-107.
22. EXCESSIVE POS MOD SIGNAL REQUIRED TO SECURE FULL MODULATION. *(Also refer to troubles No. 15, 20, and 21.)*	V-106 defective.	Replace V-106
23. EXCESSIVE SYNC SIGNAL REQUIRED FOR "SIN SYNC," "POS SYNC," or "NEG SYNC" SETTINGS OF S-101.	V-101 defective.	Replace V-101.
	V-102 defective.	Replace V-102.
	Bias across R-174 excessive.	Check R-174 (in V-102 cathode circuit) and replace if resistance is high.
24. FREE-RUNNING PULSES WHEN UNDESIRED.	If repetition rate depends on "PULSE RATE" control setting, V-102 bias return through S-101C probably defective.	Check V-102 bias return through S-101C (see figure 7-2) and check S-101C. Replace if defective. Check for defective wiring to S-101C.
	If character of pulses depends on settings of "PULSE DELAY" control, V-104 is probably defective.	Replace V-104. Check R-116 (see figures 7-1, 7-1B and 7-1C) and replace if resistance is low.
	If character of pulses depends on setting of "PULSE WIDTH" control, V-106 bias is probably incorrect.	Check voltage from pin 1 to pin 7 of V-120. Check R-172, R-173, R-203, C-117B and C-117C (designated C-138A and C-138B in Contracts N383s-60879, -61060, and -75748; designated C-133A and C-133B in TS-419A/U.) In equipments of Contracts N383s-5019A, -45741, and -67816, check R-132, R-148, R-191, and V-122, figure 7-1A. Replace any defective part. Check —325 volt lead to S-101D.
25. "PULSE WIDTH" CONTROL RANGE INADEQUATE.	If range is almost adequate at either end, either V-106 or V-107 is defective.	Replace V-106 or V-107.
	If only very long pulses are obtained, L-103 may be open.	Check continuity of L-103 (refer to table 4-7) and replace if defective.
	If only very short pulses are obtained, C-113 or lead to it may be open.	Check continuity to C-113. (See figures 7-2, 7-2A, 7-2B, 7-2C, and 7-2D.) Check C-113 and replace if required.
	If maximum width is inadequate, C-126 or C-113 may be defective.	Check C-126 and C-113, and replace if necessary.

TABLE 4-2. TROUBLE-SHOOTING CHART (Cont.)

SYMPTOM	*PROBABLE CAUSE*	*REMEDY*
26. "PULSE DELAY" CONTROL RANGE INADEQUATE.	If range is almost adequate at either end, V-104 is probably defective.	Replace V-104.
	If maximum delay is much too short, C-109 is probably defective.	Check C-109 and replace if necessary.
	If minimum delay cannot quite be reached, either V-102 is excessively biased or V-101 has insufficient gain.	Check bias on V-102. (See figure 7-4.) Test V-101 in Tube Tester I-177A. Replace if necessary.
27. "PULSE RATE" CONTROL RANGE INADEQUATE.	If maximum rate on "RATE X10" range is too low, trouble may be defective V-102 or excess capacity in C-106 or C-108, or excessive resistance in R-108, R-109, or R-112.	Test V-102 in Tube Tester I-177A. Check all detailed parts noted and replace if necessary. Use correct value of R-109. Refer to listing in table 6-4.
	If minimum rate on "RATE X10" is too high, trouble may be inadequate resistance in R-110.	Check value of R-110 with Multimeter TS-352/U and replace if necessary.
28. "PULSE RATE" RANGES DO NOT TRACK.	C-106 value taken in conjunction with C-108 and R-112 sets "RATE X10" range.	Check C-106, C-108, and R-112. (See figures 7-1, 7-1A, and 7-1B.) Replace if necessary.
	C-105 value in conjunction with C-108 and R-112 sets "RATE X1" range.	Check C-105, C-108, and R-112. (See figures 7-1, 7-1A, 7-1B, and 7-1C.) Replace any defective part.
	If "RATE X10" range is nearly correct but "RATE X1" range is incorrect, C-105 or C-108 is defective.	Check C-105 and C-108. Replace if necessary.
29. EXCESSIVE STANDING-WAVE RATIO LOOKING BACK INTO "R-F OUTPUT" CONNECTOR J-105.	Defective output cable W-105.	Replace output cable W-105. Refer to paragraph 10.*e.* of this section.
30. EXCESSIVE R-F LEAKAGE FROM VIDEO RECEPTACLES.	Defective filter Z-101, Z-102, Z-103, Z-104, or Z-105.	Localize defective filter and replace. Refer to paragraphs 9.*f.* and 10.*c.* of this section.
31. EXCESSIVE R-F LEAKAGE NEAR SIGNAL FREQUENCY SHAFT.	Loose screws H-102, H-103, H-104, H-162, H-163, H-164.	Tighten loose screws. (See figure 7-7.)

4. TEST EQUIPMENT REQUIRED.

Test equipment required to perform alignment and adjustment tests on Signal Generator TS-419/U is listed in table 4-3.

TABLE 4-3. TEST EQUIPMENT REQUIRED

Type of Test Equipment	*Preferred Type or Required Characteristics*	*Alternate*
A-c vacuum tube voltmeter	Voltmeter TS-375/U	Hewlett-Packard 410-B General Radio 1800-A
Antenna	Tunable dipole for 900–2100 mc/sec, 50-ohm input impedance	———
Audio oscillator	Audio Oscillator TS-382A/U	Hewlett-Packard 200C Hewlett-Packard 205AG
Crystal rectifier	Rectifier 1N21 in UG-119/UP mount	———
D-c vacuum tube voltmeter	Voltmeter TS-375/U	RCA 165 Hewlett-Packard 410-B
Frequency meter	Frequency Meter TS-186/AP	General Radio Model 720-A and Ferris Calibrator Model 34
Loop	⅜″ x ⅝″ loop on UG-290/U connector	———
Multimeter for 1,000 ohms-per-volt readings	Multimeter TS-297/U	Simpson 443 Weston 663
Multimeter for 20,000 ohms-per-volt readings	Multimeter TS-352/U	Navy OE Simpson 260 Weston 790
Oscilloscope	Oscilloscope TS-239/UP	———
Plug	CW-159/U	UG-83/U connector with solid cap in place of standard cable clamping nut
Power meter	Hewlett-Packard 430-B with Hewlett-Packard 475-B mount	Power meter capable of measuring 0.25 milliwatt of power (−6 dbm) to an accuracy of ±5 per cent. Input impedance to be 50 ohms at 1600 mc/sec, preferably over range of 900-2100 mc/sec. Thermistor or barretter in suitable mount and associated bridge indicating devices may be used.
Pulse generator	Pulse Generator TS-592/U	Hewlett-Packard 212-A
Receiver	Radio Receiver AN/SPR-1 or AN/APR-1; or Radio Receiver AN/SPR-4 or AN/APR-4 with Tuning Units TN-3 and TN-19	———
Signal generator	Signal Generator TS-419/U	———
Slotted line	Hewlett-Packard 805A	General Radio Type 874-LB with 874D-20 stub and adapters to BNC connectors
Tube tester	Tube Tester, Signal Corps Type I-177A	Hickok 540 Hickok 547

5. REMOVAL AND REPLACEMENT OF CHASSIS.

WARNING

> This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Observe all safety regulations.

a. REMOVING THE CHASSIS.—Remove the chassis from the instrument case by loosening the eight captive screws on the front panel and the two on the rear of the instrument case. Grasp the two handles on the front panel and pull the chassis out of the case.

b. REPLACING THE CHASSIS.—When replacing the chassis in the instrument case, stand the instrument case on its back, lift the chassis by the two handles on the front panel and lower the chassis into the instrument case. Start the captive screws on the front panel, then erect the instrument case and start the two captive screws at the rear of the case. Tighten all screws, especially the two rear screws, to provide heat conductivity from the chassis to the instrument case.

6. REPLACEMENT OF VACUUM TUBES.

a. GENERAL.—All tubes supplied with Signal Generator TS-419/U have a life expectancy of 1000 to 1500 hours. No absolute discard data exist for these tubes, and therefore they may be used until proven defective. In general, the troubles that can be attributed to faulty tubes are insufficient power output and faulty pulsing. All tubes except the r-f oscillator tube are accessible for replacement immediately after removal of the chassis from the instrument case.

b. PRECAUTIONS.—Replacement of the following tubes may require that certain circuits of Signal Generator TS-419/U be recalibrated. These tubes and the required recalibration are as follows:

(1) V-102: Recalibrate PULSE RATE control. Refer to paragraph 8.*f.*, this section.

(2) V-104: Recalibrate PULSE DELAY control. Refer to paragraph 8.*e.*, this section.

(3) V-106 or V-107: Recalibrate PULSE WIDTH control. Refer to paragraph 8.*d.*, this section.

(4) V-111: Reset reflector voltage adjustments R-180 and R-188 and reset SIGNAL FREQUENCY dial. Refer to paragraphs 7.*e.* and 8.*b.*, this section.

(5) V-120: Reset the VOLTAGE ADJ. resistor R-179. Refer to paragraph 7.*b.*, this section.

c. REPLACEMENT OF R-F OSCILLATOR TUBE V-111. *(See figure 7-7.)*

Note

> Several different identification markings have been employed for the reflex klystron (V-111) used in Signal Generator TS-419/U. In all early models, the klystron was stamped either "6BM6" or "JAN 6BM6." In an intermediate part of the production, tubes marked "PULSE TESTED 6BM6" were supplied; chassis of this production were stamped "USE PULSE TESTED 6BM6 TUBE." In later and present equipment production, tubes stamped JAN-6BM6A are used. The JAN-6BM6A is identical to the 6BM6 and JAN 6BM6 except that it has been tested for pulsed service. It is manufactured to the same specification as the "PULSE TESTED 6BM6." If available, for all replacements of V-111 use tubes marked JAN-6BM6A. Most 6BM6 reflex klystrons with other markings will also perform satisfactorily over most of the tuning range of Signal Generator TS-419/U, but some may have excessive jitter or excessive decay time over part of the tuning range.

The r-f oscillator tube V-111 is plugged into the socket assembly H-106, which in turn plugs into the rear of the cavity where it is secured by a large knurled ring-nut, H-105. To remove V-111 prior to replacement, proceed as follows:

(1) Loosen the nut H-105; then *simultaneously rotate and withdraw* the socket assembly H-106.

WARNING

> Removal of the leads from the three projecting terminals is not necessary, but simultaneous rotation and withdrawal is essential to prevent the tube being left within the cavity. Also, if the signal generator has recently been shut down, the metal ring near the base pins of V-111 may be very hot. Avoid contact with this ring.

(2) To remove the tube, grasp it by either of the gold-plated rings and pull.

(3) Inspect the contact fingers. If badly corroded or distorted, replace the r-f assembly. (Refer to paragraph 10.*f.*, this section.)

Note

> It is very important that all spring fingers in the cavity make good contact with the tube elements since even a few poor-contacting fingers can prevent the tube from oscillating. Refer to paragraph 10.*j.*(4)(*c*), this section.

(4) Install the replacement tube and replace the socket assembly by inserting the assembly carefully within the cavity and press all the way until it meets a positive stop. Definite resistance will be encountered during this insertion as the internal contact fingers engage the tube.

CAUTION

> If the tube does not start its engagement readily, it should be rotated until it finds its center, since excessive force may damage the tube and/or the cavity.

(5) When the tube is properly seated, the beginning of the flared portion of the socket assembly housing H-106 should lie within about ⅛ inch from the rear of the large knurled ring-nut H-105. The socket assembly should be rotated so that the three terminals face away from the high-frequency adjustment R-188. Tighten the nut H-105 hand-tight to secure the socket assembly in place and prevent r-f leakage.

(6) Perform the adjustments described in paragraphs 7.*e.* and 8.*b.* of this section.

7. INITIAL ELECTRICAL ADJUSTMENTS.

a. GENERAL.—The initial electrical adjustments and checks made at the factory prior to calibration of Signal Generator TS-419/U are described here to facilitate the work of maintenance personnel who may be required to repair or recondition the equipment. It is necessary to remove the TS-419/U chassis from its instrument case in order to perform these adjustments. (Refer to paragraph 5.*a.*, this section.)

b. REGULATED VOLTAGE ADJUSTMENTS. (*See figure* 5-2.)—Adjust the B voltage being supplied to Signal Generator TS-419/U as follows:

(1) Remove reflex klystron oscillator tube V-111 from the cavity. (Refer to paragraph 6.*c.*, this section.)

(2) Set VOLTAGE ADJ. potentiometer R-179 fully counterclockwise.

(3) Set SELECTOR SWITCH to ZERO SET.

(4) Connect the power cable between POWER INPUT connector and a nominal 115-volt, a-c. 50-1600 cps power source. Throw POWER OFF ON switch to ON position. Allow a 20-minute warm-up period to insure complete stabilization.

(5) Adjust VOLTAGE ADJ. until the supply voltage as measured from any red lead to chassis is 325 volts ±5 volts.

Note

> The meter used for the voltage check should be of such accuracy as to insure compliance with the stated tolerance. In general this will require the use of a meter which has been checked against an accurate standard. The total internal resistance of the meter used may be as low as 50,000 ohms on the scale actually employed.

(6) Secure the locking nut on VOLTAGE A potentiometer R-179.

c. VOLTAGE CHECKS.—Perform the voltage chec listed in table 4-4, using either Multimeter TS-297/ or, preferably, Multimeter TS-352/U, as follows:

(1) With primary a-c power applied, throw POW OFF ON switch to ON position.

(2) Set the line voltage to 115±2 volts. Allo a 20-minute warm-up period before making measurements.

d. PANEL METER ZERO ADJUSTMENTS.—T zero-adjust the METER, proceed as follows:

(1) Turn on Signal Generator TS-419/U an allow a minimum warm-up period of 20 minutes t insure complete stabilization.

(2) Set SELECTOR SWITCH to ZERO SET.

(3) Set ZERO SET control to mid-scale (line on kno vertical).

(4) Adjust ZERO ADJ. potentiometer R-146 until METER pointer is on line marked "zero set". (See figure 5-2.)

(5) Secure locking nut on ZERO ADJ. potentiometer R-146. (See figure 5-2.)

e. REFLECTOR VOLTAGE ADJUSTMENTS.—Adjust the reflector voltage as follows:

(1) Disconnect primary power from Signal Generator TS-419/U by disconnecting the power cable from POWER INPUT connector.

(2) If required, install reflex klystron tube V-111. (Refer to paragraph 6.*c.*, this section.)

(3) Tune SIGNAL FREQUENCY control clockwise until the low-frequency stop is reached.

(4) Make a visual check to ascertain that the movable contact on the reflector tracking variable resistor R-185 is located within ¼-inch of the counterclockwise end of the winding as viewed from the rear of Signal Generator TS-419/U. (See figure 5-2.)

(5) Make circuit connections to required test equipment as shown in figure 4-3.

(6) Turn on Signal Generator TS-419/U and allow a minimum warm-up period of 20 minutes to insure complete stabilization.

(7) Set Signal Generator TS-419/U controls as follows:

SIGNAL FREQUENCY	Refer to paragraphs 7.e. (8) and 7.*e.*(9) of this section.
OUTPUT ATTENUATOR	—3 dbm
POWER SET	Mid-scale (line on knob vertical)
SELECTOR SWITCH	RATE X1
PULSE WIDTH	1

TABLE 4-4. VOLTAGE MEASUREMENTS FOR INITIAL ELECTRICAL ADJUSTMENTS

Negative Meter Lead	*Positive Meter Lead*	*Nominal Voltage*	*Tolerance (±)*	*Selector Switch*	*Notes*
Any red lead	Chassis	325	5	ZERO SET	
V-113, pin No. 4	Any red lead	925	30	ZERO SET	
V-117, pin No. 7	Chassis	925	30	ZERO SET	
V-120, pin No. 7	Any red lead	150	6	ZERO SET	
V-122, pin No. 7	Chassis	150	6	ZERO SET	
V-110, pin No. 3	Any red lead	300	12	NEG MOD	
V-110, pin No. 3	Any red lead	300	12	POS MOD	
V-110, pin No. 3	Any red lead	300	12	RATE X10	
V-110, pin No. 3	Any red lead	300	12	RATE X1	
V-110, pin No. 3	Any red lead	0	1	CW	
V-110, pin No. 3	Any red lead	300	12	ZERO SET	
V-110, pin No. 3	Any red lead	300	12	POS SYNC	
V-110, pin No. 3	Any red lead	300	12	NEG SYNC	
V-110, pin No. 3	Any red lead	300	12	SIN SYNC	
C-117B terminal	C-117 case	62	4	ZERO SET	250 v scale; Multimeter TS-352/U
V-121, pin No. 2	V-121, pin No. 7	6.3	0.4	ZERO SET	10 v a-c scale
V-116, pin No. 2	V-116, pin No. 7	6.3	0.4	ZERO SET	
V-112, pin No. 2	V-112, pin No. 8	5.0	0.3	ZERO SET	
V-113, pin No. 2	V-113; pin No. 8	5.0	0.3	ZERO SET	

PULSE DELAY	3
PULSE RATE	400

(8) Set HI. FREQ. ADJ. potentiometer R-188 to produce the most rectangular pulse as the SIGNAL FREQUENCY control is tuned over the range 1700-2100 mc/sec. Points to be watched for are, in order of importance:

(*a*) Avoid any holes (regions of tuning where the pulse disappears).

(*b*) Minimize any jitter on leading edge of pulse.

(*c*) Produce widest pulse in any region of tuning where the pulse tends to narrow down.

(9) Set LO. FREQ. ADJ. potentiometer R-180 to produce the most rectangular pulse as the SIGNAL FREQUENCY control is tuned over the range 900-1400 mc/sec. Points to be watched for are, in order of importance:

(*a*) Avoid any extra pulse preceding the rise, or following the decay of the main pulse.

(*b*) Avoid any rise in the pulse just before the final decay.

(*c*) Minimize any steps on the pulse decay.

(*d*) Minimize decay time.

(10) Repeat step (8).

(11) Repeat step (9).

Note

The two reflector tracking adjustment steps (8) and (9) are different from those which produce maximum cw output. Adjustment for maximum cw output will not generally produce satisfactory pulsing over the frequency range.

(12) If erratic operation is observed, particularly near the high-frequency end of the tuning range, the cavity assembly probably requires maintenance. Refer to paragraph 10.*j*. of this section.

8. CALIBRATION ADJUSTMENTS.

a. GENERAL.—Calibration adjustments and checks for Signal Generator TS-419/U are described here to facilitate the work of maintenance personnel responsible for the repair of the equipment. In order to perform these adjustments the signal generator chassis must be removed from its instrument case. Refer to paragraph 5.*a.*, this section.

b. SIGNAL FREQUENCY DIAL ADJUSTMENTS. (*See figure* 7-5.)—To adjust the signal frequency dial proceed as follows:

(1) Connect Signal Generator TS-419/U and required test equipment as shown in part A or B of figure 4-1. The method of connection will depend on the test equipment in use.

(2) Turn on Signal Generator TS-419/U and allow a 20-minute warm-up period to insure complete stabilization.

(3) Turn on Frequency Meter TS-186/AP or alternate General Radio Hetrodyne Frequency Meter Model 720-A and Ferris Calibrator Model 34.

(4) Set the external frequency meter to a frequency that is an exact submultiple of 1800 mc/sec. When Frequency Meter TS-186/AP is used, a convenient value is 900 mc/sec. When General Radio Co. Type 720-A frequency meter is used, a convenient value is 150 mc/sec. In either case the exact frequency setting is determined by obtaining a zero beat in the headset with a suitable harmonic of the crystal calibrator.

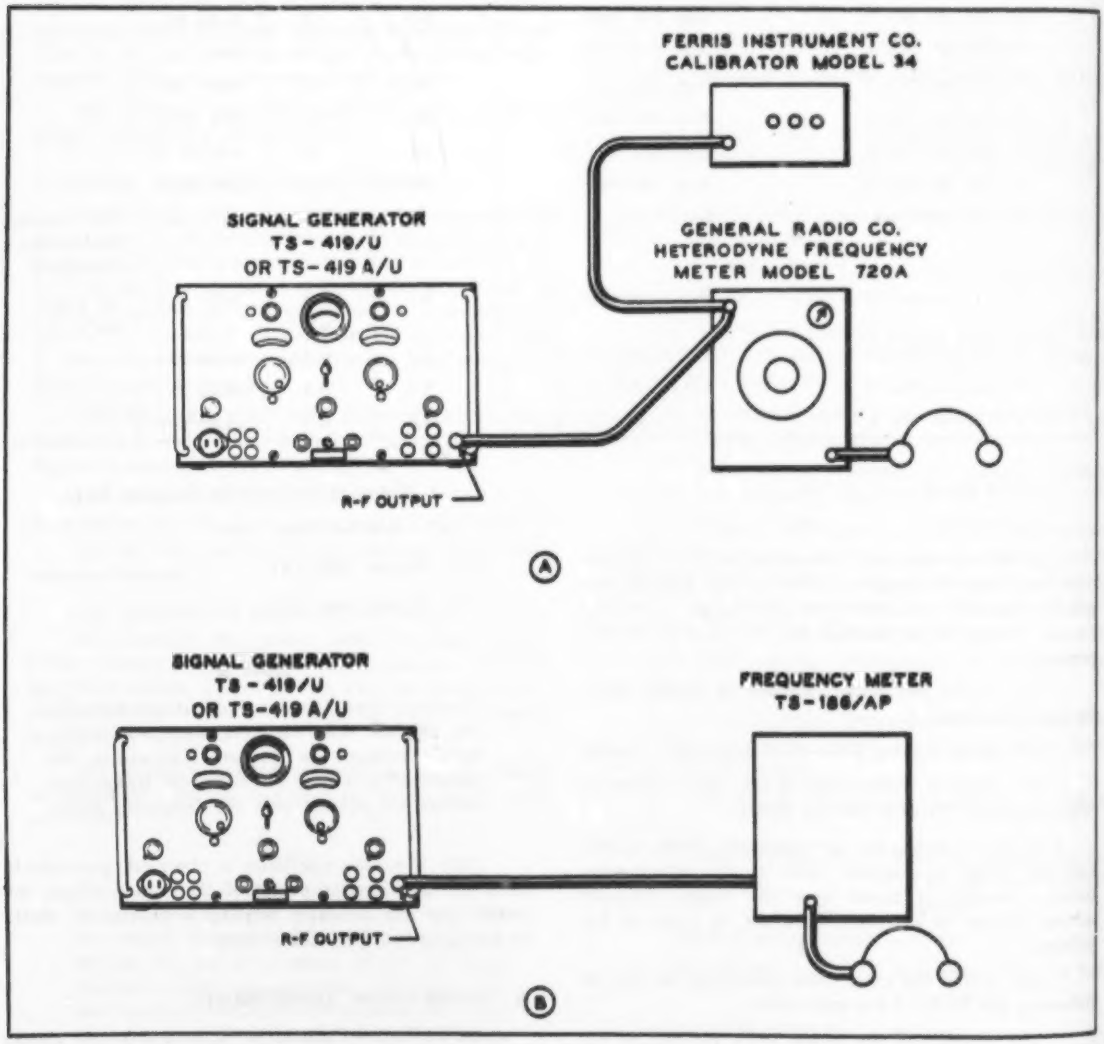

FERRIS INSTRUMENT CO.
CALIBRATOR MODEL 34
SIGNAL GENERATOR
TS - 419/U
OR TS - 419 A/U
GENERAL RADIO CO.
HETERODYNE FREQUENCY
METER MODEL 720A
R-F OUTPUT
Ⓐ
SIGNAL GENERATOR
TS - 419/U
OR TS-419 A/U
FREQUENCY METER
TS-186/AP
R-F OUTPUT
Ⓑ

Figure 4-1. Test Connection Diagram for Measurement of Radio Frequency

(5) Once the frequency meter has been set, turn off the crystal calibrator.

(6) Set SELECTOR SWITCH to ZERO SET and adjust ZERO SET control until METER pointer is on line marked ZERO SET.

(7) Set OUTPUT ATTENUATOR to —3 dbm.

(8) Set SELECTOR SWITCH to CW.

(9) Tune SIGNAL FREQUENCY control until an actual measured output frequency of 1800 mc/sec, as determined by observation of a beat in the headset of the frequency meter, is obtained with the POWER SET control adjusted to produce a METER reading of 0 dbm (the mid-scale red line marked "power set"). This output frequency should occur for a signal frequency dial reading between 1700 and 1900 mc/sec.

(10) Turn off Signal Generator TS-419/U.

(11) If the dial reading observed in step (9) is between 1795 and 1805 mc/sec, no further adjustment is required.

(12) Remove power from Signal Generator TS-419/U for the following adjustment: To readjust the signal frequency dial, the dial should be slipped against noticeable frictional resistance by pressing the forefingers against the edge of the dial to rotate until the dial reads 1800 mc/sc. The signal frequency dial is now calibrated to read directly the r-f output frequency obtained at the RF OUTPUT connector J-105.

Note

In equipments of Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651, the signal frequency dial is equipped with a locking screw. This screw is accessible through a hole in the dial, after removing the dial knob and setting the dial to approximately 1750 mc. In equipments of Contract No. NOa(s)-12279, set the dial to approximately 900 mc. Before proceeding with the adjustment described in paragraphs 8.*b*(12) and 8.*b*(13), it will be necessary to unlock the dial by inserting a screw driver through the hole and turning the locking screw a quarter-turn counterclockwise.

(13) Perform additional checks of signal frequency according to above procedure but employing settings as follows:

Signal Generator TS-419/U Nominal	*Signal Frequency Tolerance*	*Frequency Meter TS-186/AP Frequency*	*General Radio Frequency Meter 720-A Frequency*
900	±5	900	150
1500	±8	750	150
2100	±11	1050	150

In the case of Contract No. NOa(s)-12279, the check frequencies are selected as desired throughout the band and are within one percent.

(14) In equipments of Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651, the signal frequency dial was equipped with a locking screw. (Refer to preceding note.) Upon the completion of the adjustments previously described, tighten this locking screw by turning clockwise.

c. OUTPUT ATTENUATOR CALIBRATIONS. (*See figures 7-5, 7-6 and 7-7.*)—To calibrate the output attenuator dial, proceed as follows:

(1) Make circuit connections to required test equipment as shown in figure 4-2.

(2) Check to be sure that the clockwise stop on the OUTPUT ATTENUATOR control is effective at a dial setting of 160 K.

(3) If necessary to reset OUTPUT ATTENUATOR stop, refer to paragraph 10.*i*.(4) (*f*) of this section.

(4) Turn on Signal Generator TS-419/U and Thermistor Bridge Hewlett Packard 430-B, or equivalent. Allow a 20-minute warm-up period to insure complete stabilization.

(5) Tune SIGNAL FREQUENCY control of Signal Generator TS-419/U to 1600 mc/sec.

(6) Set SELECTOR SWITCH to ZERO SET and adjust ZERO SET control until METER pointer is on line marked ZERO SET.

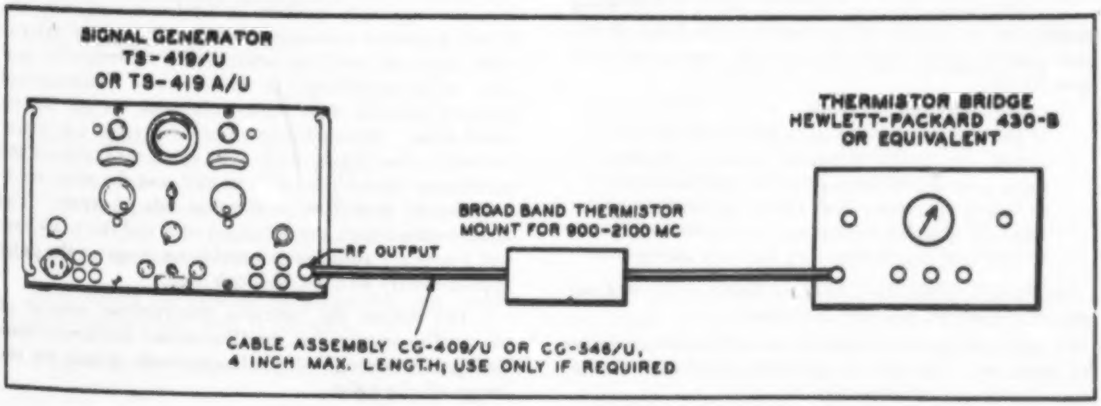


Figure 4-2. Test Connection Diagram for Measurement of R-F Power Output

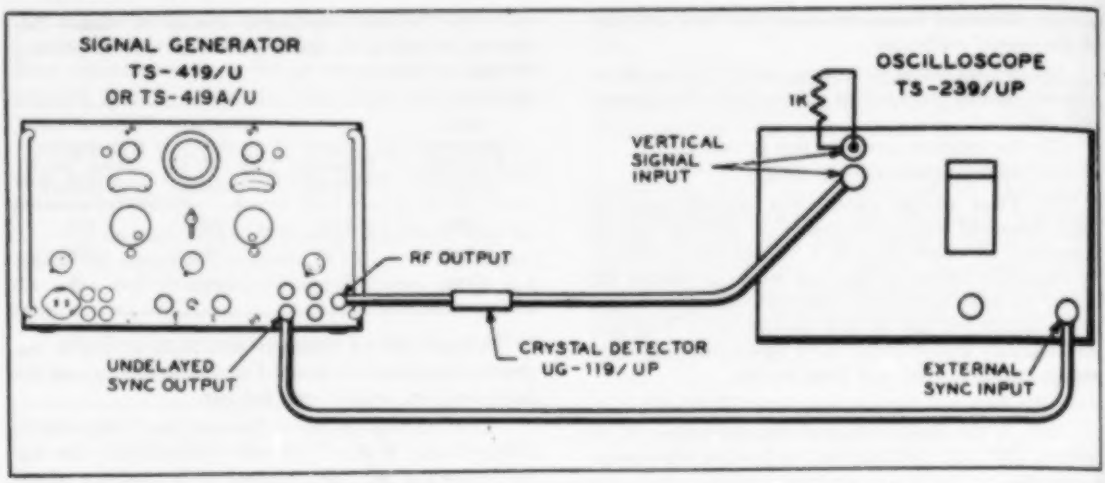


Figure 4-3. Test Connection Diagram for Measurement of Pulse Width

(7) Set SELECTOR SWITCH to CW and adjust POWER SET control to produce a METER reading of 0 dbm. Set OUTPUT ATTENUATOR to —6 dbm.

(8) Observe the power level indicated on power meter. If the indicated power level is between —6.5 and —5.5 dbm, make no further adjustments.

(9) If further adjustment is required, proceed as follows:

(*a*) Lock OUTPUT ATTENUATOR with dial set at —6 dbm.

(*b*) Loosen the two set screws in hub O-110 which carries the attenuator piston rack driving gear O-109.

(*c*) Slide attenuator piston O-107 in or out as required to obtain a reading of —6 dbm on the external power meter.

CAUTION

Make certain that the METER still reads +0 dbm and that the attenuator dial still reads —6 dbm.

(*d*) Secure and seal the set screws in O-110, being careful not to disturb the position of either the attenuator piston control shaft O-111 or the attenuator drive gear O-109.

Note

If the shaft O-111 has been burred so that set screws cannot be tightened without pulling drive gear O-109, loosen the two rear set screws in hub O-112, rotate shaft O-111 approximately one-half turn, secure and seal set screws in hub O-112, and repeat steps (*c*) and (*d*) above.

d. PULSE WIDTH CALIBRATION.—To calibrate the PULSE WIDTH proceed as follows:

(1) Connect the required test equipment as shown in figure 4-3. Be sure to provide a 1000 ohm d-c return for the crystal detector.

(2) Turn on Signal Generator TS-419/U and Oscilloscope TS-239/UP. Allow a 20-minute warm-up period to insure complete stabilization.

(3) Set Signal Generator TS-419/U controls as follows:

SIGNAL FREQUENCY	1500
OUTPUT ATTENUATOR	—3
POWER SET	As required
SELECTOR SWITCH	As required
PULSE RATE	400
PULSE DELAY	3 (refer to text)
PULSE WIDTH	As required

(4) Set SELECTOR SWITCH to ZERO SET and adjust ZERO SET control until METER pointer is on line marked "zero set".

(5) Set SELECTOR SWITCH to CW and adjust POWER SET control to produce a METER reading of +3 dbm.

(6) Set SELECTOR SWITCH to RATE X1.

(7) Make necessary adjustments on Oscilloscope TS-239/UP to obtain a sweep approximately 15 microseconds long with markers at 1-microsecond intervals. It will be found convenient to adjust the SWEEP TIME—FINE INCREASE and the HORIZONTAL POSITIONING controls of the oscilloscope so that alternate 1-microsecond markers coincide with major divisions on the illuminated scale. Minor divisions then represent 0.4 microseconds. (See figure 4-4.) The SYNC SELECTOR on the oscilloscope should be set to HI EXT, and the SYNC VOLTAGE control should be on the plus side of center. The MULTIPLIER switch should be set to 1 and the GAIN control (vertical) adjusted to provide an image of the pulse approximately 10 scale divisions high.

(8) Adjust the VERTICAL POSITIONING control of the oscilloscope so that the illuminated horizontal scale line passes through the half-amplitude points on the image of the pulse.

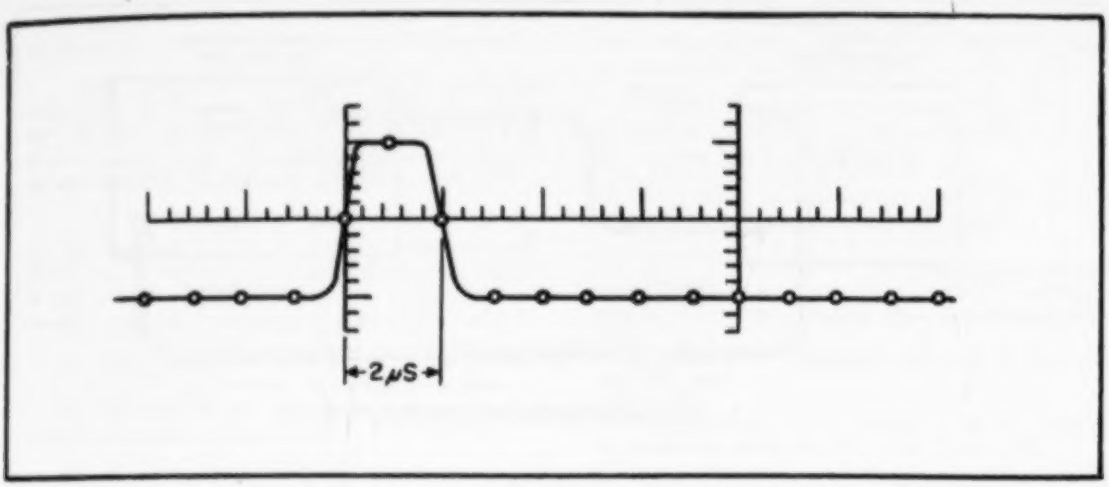


Figure 4-4. Typical Pattern for Measurement of Two-microsecond Pulse

(9) The width of r-f pulses between half-amplitude points may now be read from the horizontal scale since the number of microseconds per scale division is known from the immediately preceding comparison of the scale with the markers.

Note

It will be found convenient to adjust the PULSE DELAY control of the signal generator so that the half-amplitude point of the leading edge coincides with one of the 1-microsecond markers.

(10) Check the range of pulse widths available by operating the PULSE WIDTH control of the signal generator. These should fall between the following limits:

Pulse Width Control Setting	*Pulse Width Must Be*	
	Greater Than	*Less Than*
(minimum for stable pulse)	—	0.8
2	1.5	2.5
5	3.8	6.2
10	7.3	12.5
fully clockwise	10.0	—

(11) If adjustment of the pulse width calibration is required, loosen the recessed-head screw in the PULSE WIDTH knob, and remove the knob.

(12) Rotate the exposed potentiometer shaft until a pulse 5 microseconds wide is obtained.

(13) With its pointer indicating 5 microseconds, carefully replace PULSE WIDTH knob without rotating the potentiometer shaft. Tighten the recessed-head screw.

(14) Recheck calibration according to (9) and (10) above.

(15) If calibration requirements are met, seal the recessed-head screw in the PULSE WIDTH knob.

(16) If calibration does not meet requirements of paragraph (9), it will generally be possible to bring it within tolerance by offsetting the pointer slightly in the required direction when performing step (13).

e. PULSE DELAY CALIBRRATION.—To adjust the PULSE DELAY calibration, proceed as follows:

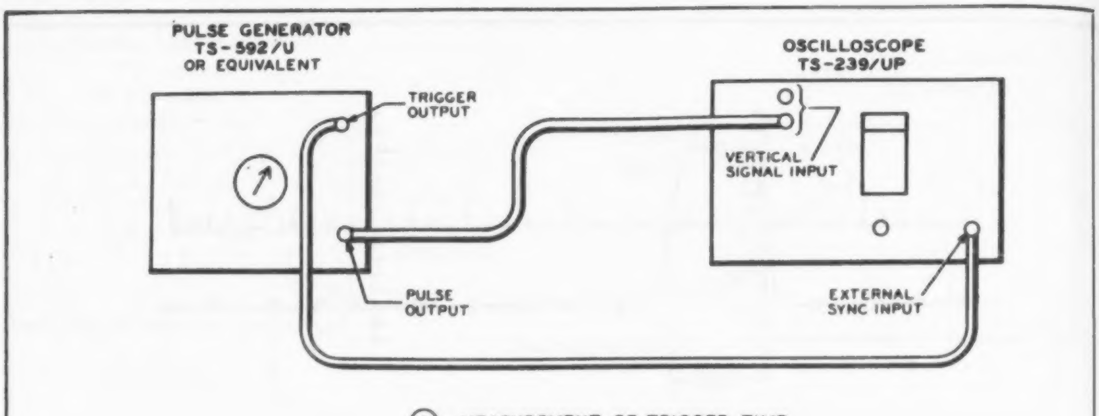
(1) Connect the required test equipment as shown in figure 4-5.

(2) Turn on the signal generator, Oscilloscope TS-239/UP, and Pulse Generator TS-592/U. Allow a 20-minute warm-up period to insure complete stabilization.

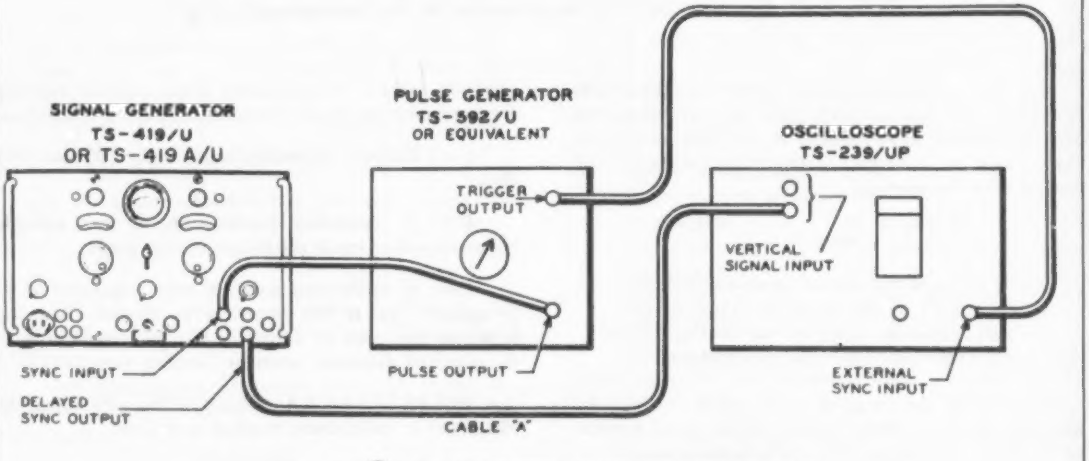
(3) Set the signal generator controls as follows:

SIGNAL FREQUENCY	(setting immaterial)
OUTPUT ATTENUATOR	(setting immaterial)
POWER SET	(setting immaterial)
SELECTOR SWITCH	NEG SYNC
PULSE WIDTH	5
PULSE DELAY	(as required; refer to text)
PULSE RATE	(setting immaterial)

(4) Set pulse generator controls to produce a negative output pulse of 10 to 20 volts amplitude, 1 to 2 microseconds width, at a repetition rate between 400 and 1000 pulses per second.


PULSE GENERATOR
TS-592/U
OR EQUIVALENT
TRIGGER OUTPUT
PULSE OUTPUT
OSCILLOSCOPE
TS-239/UP
VERTICAL SIGNAL INPUT
EXTERNAL SYNC INPUT

Ⓐ - MEASUREMENT OF TRIGGER TIME


SIGNAL GENERATOR
TS-419/U
OR TS-419 A/U
SYNC INPUT
DELAYED SYNC OUTPUT
PULSE GENERATOR
TS-592/U
OR EQUIVALENT
TRIGGER OUTPUT
PULSE OUTPUT
CABLE "A"
OSCILLOSCOPE
TS-239/UP
VERTICAL SIGNAL INPUT
EXTERNAL SYNC INPUT

Ⓑ - MEASUREMENT OF DELAYED PULSE TIME

Figure 4-5. Test Connection Diagram for Measurement of Pulse Delay

(5) Determine minimum pulse delay according to the following procedure:

(*a*) Connect the required test equipment as shown in part A of figure 4-5.

(*b*) Make necessary adjustments on Oscilloscope TS-239/UP to obtain a sweep approximately 8 microseconds long with markers at 1-microsecond intervals. It will be found convenient to adjust the SWEEP TIME—FINE INCREASE and the HORIZONTAL POSITIONING controls of the oscilloscope so that successive 1-microsecond markers coincide with major divisions on illuminated scale. Minor divisions then represent 0.2 microsecond. The SYNC SELECTOR on the oscilloscope should be set to HI EXT, and the SYNC VOLTAGE control should be on the plus side of center. The MULTIPLIER switch should be set to 30 and the GAIN control (vertical) adjusted to provide an image of the pulse approximately 10 scale divisions high. Adjust the VERTICAL POSITIONING control of the oscilloscope so that the illuminated horizontal scale line passes through the half-amplitude points on the image of the pulse.

(*c*) Note position of leading edge of pulse on oscilloscope sweep.

CAUTION

Do not disturb HORIZONTAL POSITIONING control or SWEEP TIME controls of Oscilloscope TS-239/UP until remaining steps described in (*d*) and (*e*) below have been completed.

(*d*) Change circuit connections to external test apparatus to arrangement shown in part B of figure 4-5.

(*e*) With PULSE DELAY control of the signal generator fully counterclockwise, note position of leading edge of pulse. Oscilloscope GAIN AND MULTIPLIER controls should be adjusted so that half-amplitude points on the pulse occur at the illuminated horizontal scale line.

(*f*) The difference in positions found in step (*c*) and step (*e*) is a measure of the minimum pulse delay since the number of microseconds per scale division is known from step (*b*) above. This time difference should not exceed 3 microseconds. (See figure 4-6.)

(6) Determine pulse delay for PULSE DELAY control setting of 3 microseconds. The procedure is identical to that described in (5) above. The observed delay should be less than 5 microseconds.

(7) Determine pulse delay for PULSE DELAY control setting of 50 microseconds. The procedure is identical to that described in (5) above except that a sweep length of approximately 80 microseconds with 10-microsecond markers should be employed. The delay should be greater than 40 microseconds and less than 60 microseconds.

(8) Determine pulse delay for PULSE DELAY control setting of 300 microseconds. The procedure is identical to that described in (5) above except that a sweep length of approximately 500 microseconds with 100-microsecond markers should be employed. The delay should be greater than 230 and less than 370 microseconds.

(9) Determine pulse delay for maximum clockwise setting of PULSE DELAY control. The delay should be greater than 300 microseconds.

(10) If adjustment of the pulse delay calibration is required, loosen the recessed head screw in the PULSE DELAY knob, and remove the knob.

(11) Rotate the exposed potentiometer shaft until a pulse delay of 50 microseconds is obtained.

(12) With its pointer indicating 50 microseconds, carefully replace PULSE DELAY knob without rotating the potentiometer shaft. Tighten the recessed-head screw.

(13) Recheck calibration according to (6), (7), and (8) above.

(14) If calibration requirements are met, seal the recessed-head screw in the PULSE DELAY knob.

(15) If calibration does not meet the requirements of (6), (7), and (8) above, it will generally be possible to bring it within tolerance by offsetting the pointer slightly in the required direction when performing step (12).

f. PULSE RATE CALIBRATION.—To adjust the PULSE RATE calibration, proceed as follows:

(1) Connect the required test equipment as shown in Part B of figure 4-7. (A schematic diagram of the phase shift and isolation network referred to in part B of figure 4-7 is shown in part A of figure 4-7.) Turn the equipment on and allow a 20-minute warm-up period to insure complete stabilization.

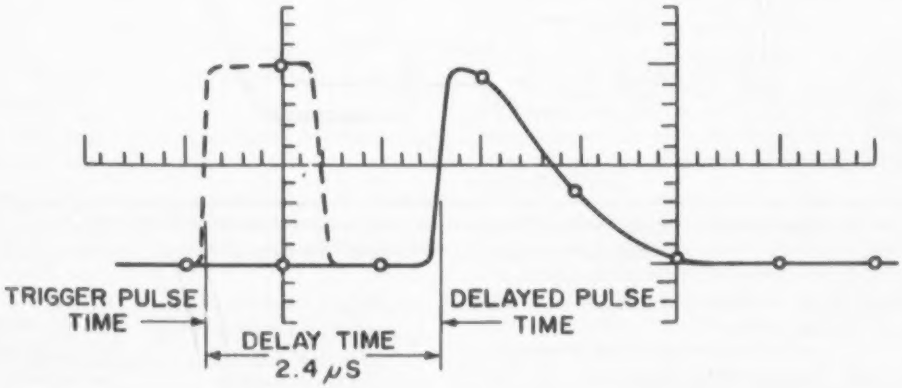
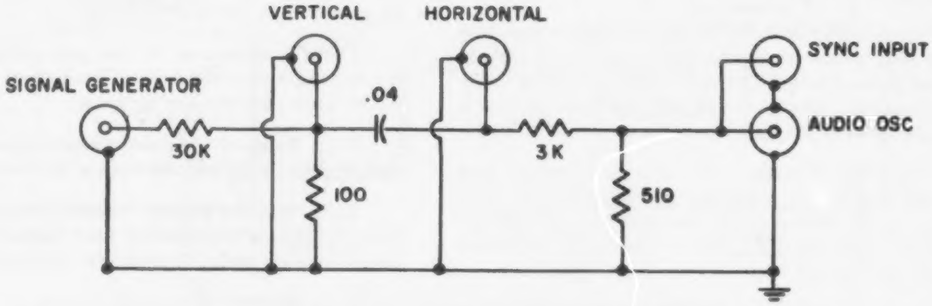


Figure 4-6. Time Relationships in Delay Measurements


VERTICAL
HORIZONTAL
SYNC INPUT
SIGNAL GENERATOR
.04
30K
3K
AUDIO OSC
100
510

Ⓐ SCHEMATIC DIAGRAM OF PHASE SHIFT AND ISOLATION NETWORK

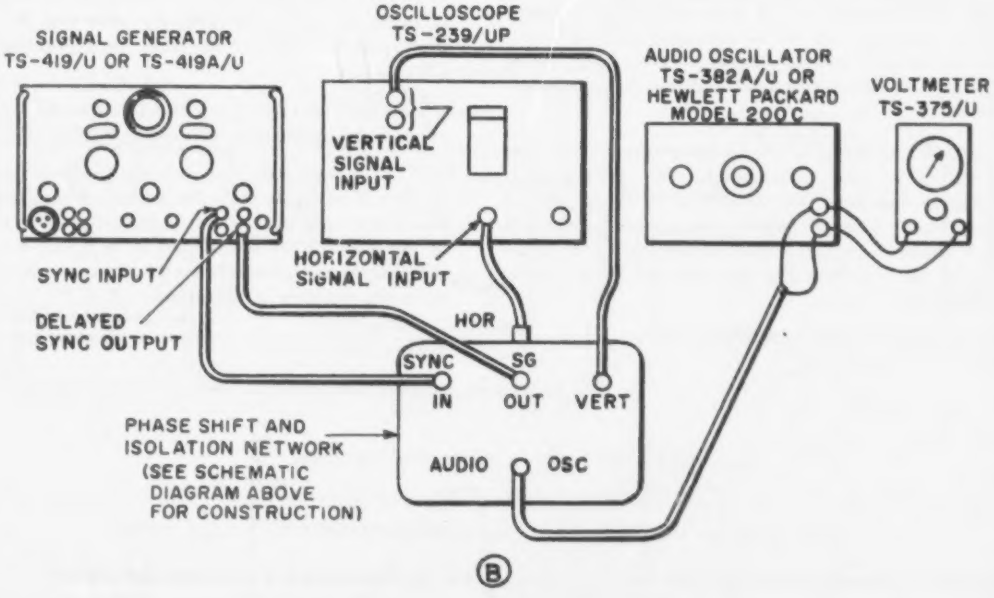

OSCILLOSCOPE
TS-239/UP
SIGNAL GENERATOR
TS-419/U OR TS-419A/U
AUDIO OSCILLATOR
TS-382A/U OR
HEWLETT PACKARD
MODEL 200C
VOLTMETER
TS-375/U
VERTICAL
SIGNAL
INPUT
HORIZONTAL
SIGNAL INPUT
SYNC INPUT
DELAYED
SYNC OUTPUT
HOR
SYNC
IN
SG
OUT
VERT
PHASE SHIFT AND
ISOLATION NETWORK
(SEE SCHEMATIC
DIAGRAM ABOVE
FOR CONSTRUCTION)
AUDIO
OSC
Ⓑ

Figure 4-7. Test Connection Diagram for Measurement of Pulse Repetition Rate and Sine Wave Synchronizing Characteristics

(2) Set Audio Oscillator TS-382/U or alternate to produce 10 volts output.

(3) Make the necessary adjustments on Oscilloscope TS-239/UP to produce an elliptic pattern of convenient size for the range of audio oscillator frequencies to be employed. SWEEP TIME—COARSE control on oscilloscope must be set to SWEEP OFF H AMP.

(4) Set the signal generator controls as follows:

SIGNAL FREQUENCY	(setting immaterial)
OUTPUT ATTENUATOR	(setting immaterial)
POWER SET	(setting immaterial)
SELECTOR SWITCH	(as required; refer to procedure)
PULSE WIDTH	10
PULSE DELAY	3
PULSE RATE	(as required; refer to procedure)

(5) Set SELECTOR SWITCH to RATE X10 or RATE X1 and adjust PULSE RATE control to setting for which pulse rate is to be checked.

(6) Sweep the audio oscillator output frequency slowly over the range in which the pulse rate is expected to lie until a single stationary pulse is observed. The lowest audio oscillator frequency setting for which a single pulse is observed gives a correct measure of the pulse repetition rate.

Note

If the audio oscillator is tuned to a multiple of the pulse repetition rate, only a single pulse will be observed, but the base line will not be cleanly broken. If the audio oscillator is tuned to a sub-multiple of the pulse repetition rate, a number of pulses will appear on the trace. Numerous non-integral frequency relationships between the audio oscillator frequency and the pulse repetition rate can give rise to multiple pulses on the trace. Disregard all audio oscillator frequency settings except the lowest one for which a single pulse is observed.

(7) Determine pulse rates according to procedure of step (6) for the following pulse rates:

Selector Switch	*Pulse Rate Control*	*Rate Must Be*	
		Greater Than	*Less Than*
RATE X1	Fully counterclockwise	——	40
RATE X1	Fully clockwise	400	——
RATE X10	Fully counterclockwise	——	400
RATE X10	Fully clockwise	4000	——
RATE X1	40	30	50
RATE X1	100	75	125
RATE X1	400	300	500
RATE X10	40	300	500
RATE X10	100	750	1250
RATE X10	400	3000	5000

(8) If adjustment is required, set the SELECTOR SWITCH to RATE X10.

(9) Loosen the recessed-head screw in the PULSE RATE knob and remove the knob.

(10) Rotate the exposed potentiometer shaft until a single pulse is seen on the oscilloscope tube pattern with the audio oscillator output frequency adjusted to 1000 cycles.

(11) With its pointer indicating 100, carefully replace PULSE RATE knob without rotating the potentiometer shaft, and secure the recessed-head screw.

(12) Check the pulse repetition rate as described in (6) and (7) above.

(13) If the pulse rate calibration meets the requirements of (7) above, seal the recessed-head screw in the PULSE RATE knob.

(14) If calibration does not meet the requirements of (7) above, it will generally be possible to bring it within tolerance by offsetting the pointer slightly in the required direction when performing step (11).

9. MISCELLANEOUS ELECTRICAL TESTS.

a. SINE WAVE SYNCHRONIZING CHARACTERISTICS.—To observe the synchronizing characteristics with sine wave input, proceed as follows:

(1) Connect the required test equipment as shown in part B of figure 4-7. (A schematic diagram of the phase shift and isolation network referred to in part B of figure 4-7 is shown in part A of figure 4-7.) Turn the equipment on. Allow a 20-minute warm-up period to insure complete stabilization.

(2) Set Audio Oscillator TS-382/U, or equivalent, to produce 10 volts output at 40 cycles.

(3) Make the necessary adjustments on Oscilloscope TS-239/UP to produce an elliptical pattern of convenient size. The SWEEP TIME—COARSE control on the oscilloscope should be set to SWEEP OFF H AMP.

(4) Set the Signal Generator TS-419/U controls as follows:

SIGNAL FREQUENCY	(setting immaterial)
OUTPUT ATTENUATOR	(setting immaterial)
POWER SET	(setting immaterial)
SELECTOR SWITCH	SIN SYNC
PULSE WIDTH	10
PULSE DELAY	10
PULSE RATE	(setting immaterial)

(5) A single spike should be observed on the oscilloscope trace. This should disappear as the 40-cycle synchronizing signal amplitude is reduced to zero, but should remain stable as that amplitude is increased to a maximum of 50 volts.

(6) Repeat steps (2) through (5) but with Audio Oscillator TS-382/U set at 400 cycles and at 4000 cycles. The input amplifier sensitivity is appreciably greater at these frequencies than at 40 cycles, so that the input level will have to be reduced much further before losing synchronization.

(7) If more than one pulse appears on the oscilloscope trace, check the audio oscillator used to supply the synchronizing signal for distortion or spurious pulses which might give rise to additional synchronizing signals. Distortion is most likely to occur at low audio frequencies and high output levels.

b. PULSE SYNCHRONIZING CHARACTERISTICS.—To observe the pulse synchronizing characteristics, proceed as follows:

(1) Connect the required test equipment as shown in part B of figure 4-5. Turn the equipment on and

allow a 20 minute warm-up period to insure complete stabilization.

(2) Set the controls of Pulse Generator TS-592/U or equivalent, to produce a negative output pulse of 10 volts amplitude, ½-microsecond width, at any convenient repetition rate between 40 and 4000 pps. A rate between 400 and 1000 pps is adequate to provide a suitably bright trace on Oscilloscope TS-239/UP.

(3) Make the necessary adjustments on the oscilloscope to obtain a sweep approximately 8 microseconds long. The SYNC SELECTOR on the oscilloscope should be set to HI EXT and the SYNC VOLTAGE control on the plus side of center. The MULTIPLIER switch should be set to 30.

(4) Set the signal generator controls as follows:

SIGNAL FREQUENCY	(setting immaterial)
OUTPUT ATTENUATOR	(setting immaterial)
POWER SET	(setting immaterial)
SELECTOR SWITCH	NEG SYNC
PULSE WIDTH	2
PULSE DELAY	5
PULSE RATE	(setting immaterial)

(5) A sync output pulse should be observed on the oscilloscope trace. This pulse should be stable and its characteristics should be essentially independent of the amplitude of the synchronizing pulse up to a maximum of 50 volts, and independent of its width up to a maximum of 30 microseconds.

(6) Repeat steps (2), (3), and (4), but with the pulse generator set to produce positive output pulses and the SELECTOR SWITCH set to POS SYNC. The oscilloscope trace described in step (5) should be the same.

c. EXTERNAL MODULATION CHARACTERISTICS.—To observe the external modulation characteristics, proceed as follows:

(1) Connect the required test equipment as shown in figure 4-8. Turn the equipment on and allow a 20-minute warm-up period to insure complete stabilization.

(2) Set the Pulse Generator TS-592 U, or equivalent, to produce a negative pulse of 40 volts amplitude and 10 microseconds width.

(3) Set the signal generator controls as follows:

SIGNAL FREQUENCY	1500
OUTPUT ATTENUATOR	—3
POWER SET	(to produce 0 dbm meter reading)
SELECTOR SWITCH	NEG MOD
PULSE WIDTH	(setting immaterial)
PULSE DELAY	(setting immaterial)
PULSE RATE	(setting immaterial)

(4) Observe the characteristics of the r-f output pulse on the oscilloscope. The pulse should be of essentially the same width as that supplied by the pulse generator and should be essentially rectangular. The top of the pulse should be flat out to its full length; however, this will not be true for pulses appreciably longer than 10 microseconds.

(5) Vary the pulse generator output pulse width down to ½ microsecond. The r-f output pulse of the signal generator should remain constant in amplitude down to approximately 0.8 microsecond. Below this, the amplitude may decrease and the pulse may even disappear entirely. This is due to the starting time required by the r-f oscillator, which tends to shorten the r-f output pulse slightly as compared with the applied video pulse. Such a condition is normal and does not indicate trouble in the signal generator.

(6) Vary the pulse generator output pulse amplitude up to 70 volts maximum. The output pulse of the signal generator may widen somewhat as the external modulating pulse amplitude is increased. This is due to a slicing action which uses only the bottom part of a pulse when the amplitude of the pulse is larger than that required for full modulation. Because of finite rise and decay times, pulses are generally wider at the base than at the top. This small slicing action may also result in slightly longer rise and decay times on the r-f output pulse, from the signal generator, than are on the video modulating pulse supplied by the external pulse generator.

(7) Repeat steps (2) through (6) but with positive pulse output from the pulse generator and with the SELECTOR SWITCH set to POS MOD. The conditions existing in steps (4), (5), and (6) will be the same.

d. SYNC OUTPUT CHARACTERISTICS.—To observe the sync output characteristics, proceed as follows:

(1) Connect the required test equipment as shown in part B of figure 4-5.

(2) Set the controls of Pulse Generator TS-592 U, or equivalent, to produce a negative output pulse of 10 volts amplitude, ½ microsecond width, at any convenient repetition rate between 40 and 4000 pps. A rate between 400 and 1000 pps is adequate to provide a suitably bright trace on Oscilloscope TS-239 UP.

(3) Make the necessary adjustments on the oscilloscope to obtain a sweep approximately 8 microseconds long. The SYNC SELECTOR on the oscilloscope should be set to HI EXT and the SYNC VOLTAGE control on the plus side of center. The MULTIPLIER switch should be set to 30.

(4) Set the signal generator controls as follows:

SIGNAL FREQUENCY	(setting immaterial)
OUTPUT ATTENUATOR	(setting immaterial)
POWER SET	(setting immaterial)

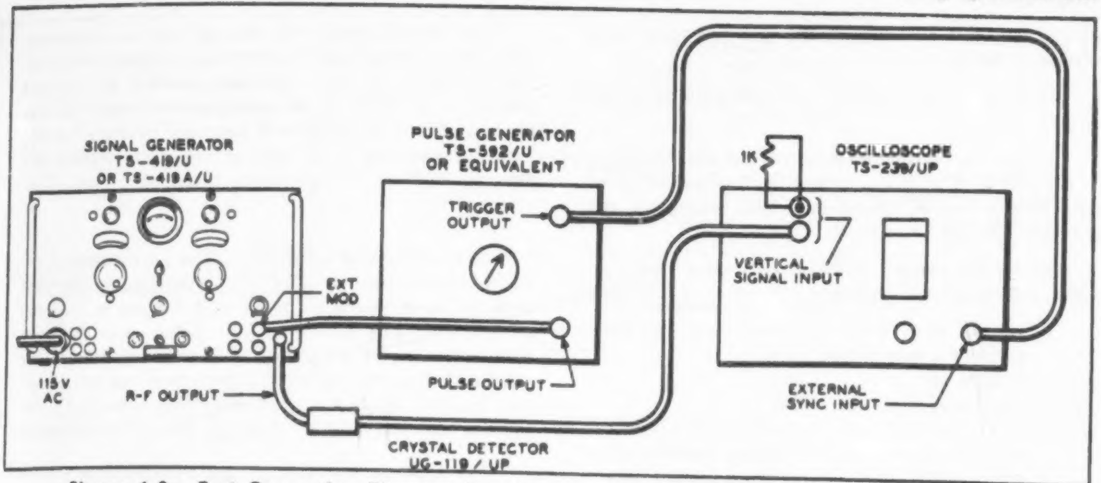


Figure 4-8. Test Connection Diagram for Measurement of External Modulation Performance

SELECTOR SWITCH	NEG SYNC
PULSE WIDTH	2
PULSE DELAY	5
PULSE RATE	(setting immaterial)

(5) A delayed sync output pulse should be observed, with the following characteristics:

(*a*) The rise time should be less than ½ microsecond.

(*b*) The pulse should be less than 5 microseconds wide between half-amplitude points. This width may be measured as described in paragraph 8.*d.* of this section. The width should vary between about 1 and 3 microseconds as the PULSE WIDTH control is varied from minimum to maximum width. The pulse may disappear completely with the control set fully counterclockwise. This is normal and does not indicate trouble.

(*c*) The pulse amplitude may be measured by using the calibrator that is part of Oscilloscope TS-239/UP. It should be between 40 and 50 volts when the DELAYED SYNC OUTPUT connector of Signal Generator TS-419/U is unloaded. It should be greater than 20 volts with any load consisting of resistance in excess of 500 ohms, shunted by capacitance of less than 1500 μμf.

(6) Undelayed sync output pulses may be observed by following the procedure outlined in steps (1) through (4), except that cable A, which feeds the vertical signal input of the oscilloscope, should be connected to the UNDELAYED SYNC OUTPUT connector of the signal generator. A sync output pulse with the following characteristics should be observed:

(*a*) The rise time should be less than 1.5 microseconds.

(*b*) The pulse should be less than 5 microseconds wide between half-amplitude points. This width may be measured by the method described in paragraph 8.*d.* of this section. The width should vary between about 1 and 4 microseconds as the pulse delay control is varied from minimum to maximum delay.

(*c*) The pulse amplitude may be measured using the calibrator which is part of Oscilloscope TS-239/UP. It should be between 40 and 50 volts when the UNDELAYED SYNC OUTPUT connector of Signal Generator TS-419/U is unloaded. It should be greater than 20 volts with any load consisting of resistance in excess of 500 ohms, shunted by capacitance of less than 1500 μμf.

e. OUTPUT ATTENUATOR IMPEDANCE.—The nominal output impedance of Signal Generator TS-419/U is 50 ohms. If power is fed back into the signal generator RF OUTPUT connector through a 50-ohm transmission line, deviation from the nominal 50-ohm output impedance will cause some of the incident power to be reflected. The result of such reflection will be a standing wave pattern on the feed line. Measurement of the ratio of the maximum-amplitude to the minimum-amplitude standing wave gives a measure of the departure of the signal generator output impedance from its nominal value. The standing wave ratio may be expressed in decibels. The larger the decibel value of the standing-wave ratio, the poorer the quality of the output attentuator termination. The actual standing-wave ratio is a function of frequency. In Signal Generator TS-419/U the standing-wave ratio varies cyclically with frequency, minima being spaced about 175 mc apart and maxima approximately half-way between. The greatest standing-wave ratio at any frequency should be less than 6 db. To measure the standing-wave ratio proceed as follows:

(1) Connect the required test equipment as shown in figure 4-9.

(2) Set the OUTPUT ATTENUATOR of the TS-419 U to be tested at −10 dbm. The signal generator to be tested should *not* be turned on. The settings of the other controls are immaterial.

(3) Set the controls of Signal Generator TS-419 U used to supply the test signals as follows:

SIGNAL FREQUENCY	2100
OUTPUT ATTENUATOR	−6
POWER SET	+3
SELECTOR SWITCH	CW
PULSE WIDTH	(setting immaterial)
PULSE DELAY	(setting immaterial)
PULSE RATE	(setting immaterial)

(4) Tune the stub on the slidable probe of the slotted line to produce maximum deflection of the meter in the detector circuit.

(5) Slide the probe back and forth along the line to locate a minimum and note the meter reading at this point.

(6) Slide the probe back and forth along the line to locate a maximum and leave the probe at this point.

(7) Decrease the OUTPUT ATTENUATOR setting from that in step (3) until the meter reads exactly the value noted in step (5). Note the setting on the DBM scale.

(8) The difference between the attenuator readings of step (3) and step (7) is the standing-wave ratio in decibels.

(9) Repeat steps (3) through (8) at frequency intervals of 20 mc down to 1800 mc. Further data may then be taken, but this is sufficient to show at least one full cycle of variation of standing-wave ratio vs. frequency. The cycle chosen will normally yield the highest value of standing-wave ratio of any cycle within the 900- to 2100-mc sec operating range of Signal Generator TS-419 U.

f. R-F LEAKAGE CHECKS.—The r-f oscillator cavity in Signal Generator TS-419 U is thoroughly shielded and the power leads to it are well filtered to prevent r-f leakage. The instrument case is not relied on as a primary means of shielding. If certain components or screws used in the assembly of the cavity are not properly secured, significant r-f leakage may occur. To determine the extent of r-f leakage, proceed as follows:

(1) Connect the required test equipment as shown in figure 4-10. Turn the equipment on and allow a minimum period of 20 minutes for warm-up to insure complete stabilization.

(2) Set the controls of Signal Generator TS-419 U as follows:

SIGNAL FREQUENCY	900
OUTPUT ATTENUATOR	—70 dbm
POWER SET	0 dbm
SELECTOR SWITCH	CW
PULSE WIDTH	(setting immaterial)
PULSE DELAY	(setting immaterial)
PULSE RATE	(setting immaterial)

(3) Temporarily connect cable CG-546 U between the receiver r-f input connector and the RF OUTPUT connector of Signal Generator TS-419/U. Tune in the TS-419 U on the receiver.

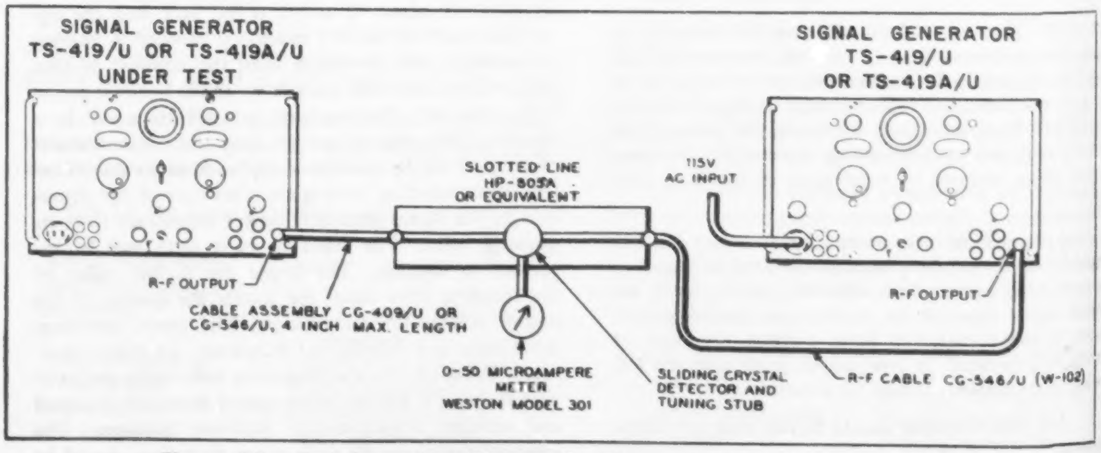

SIGNAL GENERATOR
TS-419/U OR TS-419A/U
UNDER TEST
SIGNAL GENERATOR
TS-419/U
OR TS-419A/U
SLOTTED LINE
HP-805A
OR EQUIVALENT
115V
AC INPUT
R-F OUTPUT
CABLE ASSEMBLY CG-409/U OR
CG-546/U, 4 INCH MAX. LENGTH
0-50 MICROAMPERE
METER
WESTON MODEL 301
SLIDING CRYSTAL
DETECTOR AND
TUNING STUB
R-F OUTPUT
R-F CABLE CG-546/U (W-102)

Figure 4-9. Test Connection Diagram for Measurement of Attenuator VSWR

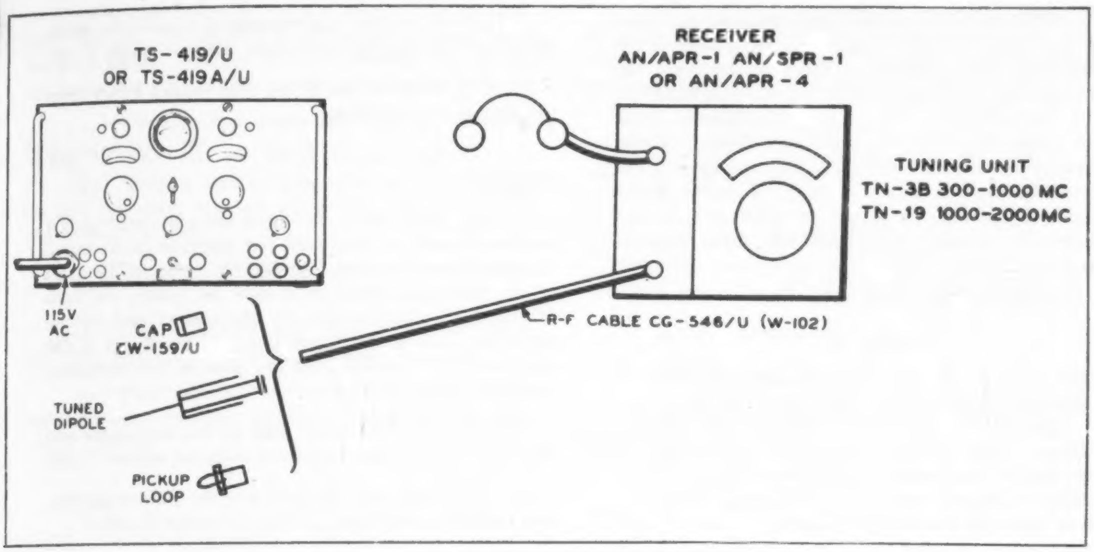


Figure 4-10. Test Connection Diagram for Measurement of R-F Leakage

(4) Disconnect the cable from the RF OUTPUT connector and attach it to the dipole antenna. This antenna should be tuned to the test frequency.

(5) Probe around the vicinity of the TS-419/U with the antenna, keeping the antenna approximately two inches from the instrument case. If leakage is found, note its intensity on the receiver, restore the connections described in step (3), and adjust the OUTPUT ATTENUATOR to give the same receiver output as the leakage value observed with the antenna. The OUTPUT ATTENUATOR reading gives a measure of the leakage observed under the given test conditions.

Note

Upon completion of step (5), check to make sure that the receiver and TS-419/U are still tuned to each other. If retuning of the receiver increases the receiver output, drift has occurred and the measurement should not be relied upon. Such drift is usually the result of inadequate warm-up of the receiver or signal generator.

(6) If leakage from the output attenuator cable is suspected, repeat the foregoing tests with the OUTPUT ATTENUATOR set at —3 dbm and the RF OUTPUT connector capped by a solid cap such as a type CW-159/U. The use of a cap is essential for this test to avoid large radiation directly from the open connector.

(7) If leakage from the video connectors of the signal generator is suspected, repeat step (3) and then connect cable CG-409/U successively to SYNC IN, UNDELAYED SYNC OUT, DELAYED SYNC OUT, and EXT MOD connectors. Leakage from any of these should not exceed 10 microvolts as determined by the substitution method described in step (5). Leakage from these receptacles usually is caused by a defective filter Z-101, or Z-102, or Z-103. It may also be due to inadequate tightening of H-101, H-107, or H-108, or to defective filter Z-104 or Z-105. Trouble should be localized by searching with the pick-up loop in place of the antenna on the receiver. Signal Generator TS-419/U must be removed from its instrument case for this procedure. (Refer to paragraph 5.*a.* of this section.) A little practice in orienting the loop of the cable and in grounding the outer conductor, if required, will make conclusive checks possible.

(8) Repeat steps (2) through (7) at 100-mc frequency intervals in the 900- to 2100-mc sec range.

10. MAINTENANCE OF R-F ASSEMBLY.

(See figures 7-5, 7-6, and 7-7.)

CAUTION

Do not disassemble the equipment any further than necessary to make the inspections, adjustments, or replacements described herein. When disassembly is necessary, follow instructions exactly. Avoid burring nuts and screws; only close-fitting or adjustable wrenches and properly ground screw drivers should be used. Replace all washers and screws on each part as it is removed so that they will be available when reassembling. Replace all lockwashers and tighten and reseal all screws when reassembling.

a. GENERAL.—The r-f assembly comprises the attenuator assembly, the power take-off "T" assembly, the dial and gear assemblies, and the cavity proper. The following detail parts can be removed without removing the r-f assembly from the chassis: thermistors, filter chokes Z-101, Z-102, Z-103, Z-104, and Z-105, reflector tracking potentiometer R-185, and the attenuator. The r-f assembly must be removed from the chassis before the following detail parts can be disassembled: r-f assembly, "T" assembly, power take-off probe, dials and gears, and the cavity proper.

b. THERMISTORS. *(See figure 7-7.)*

CAUTION

> The thermistors rarely need replacing and should be replaced only when proven defective. In general, if they have continuity they will operate satisfactorily. Continuity should be checked without removing the thermistors from their mountings; temporary unsoldering of one lead from the mounting is required.

(1) REMOVAL OF BEAD THERMISTOR TH-103.—The entire assembly of L-105 through L-108 can be disassembled from the r-f assembly, whether or not the latter has been removed from the chassis. Proceed as follows:

CAUTION

> Since bead thermistor TH-103 and its mounting are quite delicate, exercise care in performing the operations necessary for the removal and replacement of TH-103.

(*a*) Loosen and slip back the knurled nut H-108. Withdraw Z-105 from Y-105. With a small pair of tweezers, engage the projecting contact of the thermistor TH-103, which is inside the housing O-106, and carefully pull out the thermistor and the associated by-pass capacitor C-130.

(*b*) To remove O-106 from Y-105 engage a No. 10-32 screw into the threaded center hole of O-106 and withdraw the monitor mount by pulling it straight out. One of the captive screws in the front panel of the instrument case is suitable for this operation. This operation will also remove tubular spacer E-106 and mica washer E-105.

(2) REPLACEMENT OF BEAD THERMISTOR TH-103.—If the bead thermistor is found to be defective, it may be replaced with the spare thermistor carried in the small capsule located on the top of the chassis at the far left rear corner. (See figure 5-2.)

(*a*) To replace the thermistor, remove the monitor mount O-106 from the power monitor guide Y-105.

(*b*) Remove disc C-130 and washer E-105 from the defective thermistor.

(*c*) Slip washer E-105 on one lead of new thermistor.

(*d*) Push disc C-130 onto the same lead until a sudden obstacle to continued disc-travel is encountered. *Do not force the disc beyond this point.* The glass of the thermistor bead must now be within .047-inch of the disc. (If it is not, try the washer and disc on the other lead of the thermistor.) Retract disc C-130 approximately $\frac{1}{8}$ inch from the glass of the thermistor bead TH-103.

(*e*) Insert the other lead of the thermistor into the small jack in the thermistor monitor mount O-106.

(*f*) Check that the lead is in the jack by observation from the loop-end (L-105) of mount O-106.

(*g*) Pull the exposed thermistor lead through the disc away from the loop-end of the mounting assembly until a sudden obstacle to continued travel is encountered. *Do not force the lead beyond this point.* The disc must be tight on the thermistor lead.

(*h*) Push the disc and bead assembly into mount O-106 until they are seated firmly.

(*i*) Carefully insert the assembly of the disc, thermistor, and mount into the guide Y-105, locating it angularly by means of the locating pin in the guide Y-105 and slot in the mount O-106.

(*j*) Install insulating tubular spacer E-106 so as to center disc C-130.

(*k*) Install choke Z-105 and secure with nut H-108.

(*l*) Apply power to the TS-419/U, and with the SELECTOR SWITCH at ZERO SET, adjust the ZERO SET control until the fiducial line on the knob is vertical. Using a screw driver, reset the chassis-mounted ZERO ADJ. control R-146 to make the meter M-101 indicate to the ZERO SET line.

(*m*) Tap the TS-419/U in the vicinity of the bead thermistor mounting while observing the meter M-101. Jumping of the panel meter indication is evidence of poor or unstable contact in the thermistor circuit or in Z-105.

(3) REMOVAL OF DISC THERMISTOR TH-102.—The disc thermistor TH-102 can be removed from the r-f assembly whether the r-f assembly has or has not been removed from the chassis. Proceed as follows:

(*a*) Unsolder the single dark blue wire leading to the terminal E-108.

(*b*) Using a pair of long-nose pliers to engage the slots provided, unscrew nut E-109. Remove E-109 and terminal E-108.

(*c*) Remove TH-102 by pushing on terminal E-110.

(4) REPLACEMENT OF DISC THERMISTOR TH-102.—Replace TH-102 as follows:

(*a*) Place terminal assembly E-108 in nut E-109, install varnished cambric insulator, and insert disc thermistor TH-102.

(*b*) Screw nut E-109 and associated parts into its mounting, being sure that terminal E-110 is in position. The nut should be tightened, using long-nose pliers to engage the slots provided, until a positive stop is felt.

(*c*) Solder the dark blue wire (see figures 7-3 and 7-7) to terminal E-108.

(5) REMOVAL OF DISC THERMISTOR TH-101.—Disc thermistor TH-101 can be removed from the r-f assembly whether or not the r-f assembly has been removed from the chassis. Proceed as follows:

(*a*) Unscrew H-115.

(*b*) Withdraw E-107.

(*c*) Pry the disc thermistor TH-101 from its housing.

(6) REPLACEMENT OF DISC THERMISTOR TH-101.—Replace TH-101 as follows:

(*a*) Wrap disc thermistor TH-101 in the varnished cambric.

(*b*) Insert the thermistor into the hole. Be certain it is fully seated.

(*c*) Insert E-107.

(*d*) Secure H-115.

c. R-F FILTERS. (*See figure* 7-7.)—The three filters Z-101, Z-102, and Z-103, mounted on the oscillator tube socket assembly H-106, the reflector voltage filter Z-104, and the thermistor choke Z-105 can all be replaced without removing the r-f assembly from the chassis.

(1) REMOVAL OF FILTERS Z-101, Z-102, Z-103.—To remove filter Z-101, Z-102, or Z-103, proceed as follows:

(*a*) Remove socket assembly H-106 from cavity and tube V-111 from socket assembly. (Refer to paragraph 6.*c.* of this section.)

(*b*) Slip off cap O-124, O-125, or O-126 and unsolder lead to external terminal of filter to be removed.

(*c*) Unscrew plug H-123 from rear of socket assembly H-106. Use a screw driver as a lever between the pins projecting from this plug to start it.

(*d*) Unsolder lead from choke L-106 to inner terminal of Z-101, or from choke L-107 to inner terminal of Z-102, or from choke L-108 to inner terminal of Z-103, as required.

Note

Chokes L-106, L-107, and L-108, not used in equipments manufactured under Contract N383s-5019A.

(*e*) Unscrew Z-101, Z-102, or Z-103 from socket assembly H-106.

(2) REPLACEMENT OF FILTERS Z-101, Z-102, Z-103.—To replace filter Z-101, Z-102, or Z-103, proceed as follows: [See note, paragraph 10.*c.*(1).]

(*a*) Screw Z-101, Z-102, or Z-103 into socket assembly H-106 until tight.

(*b*) Replace lead from choke L-106, L-107, or L-108 to inner terminal of filter Z-101, Z-102, or Z-103, respectively.

CAUTION

It is absolutely essential that chokes L-106, L-107, and L-108 be replaced exactly in their original orientation.

(*c*) Replace plug H-123 in rear of socket assembly H-106. Be careful not to cross-thread the fine threads.

(*d*) Solder leads to external terminals of Z-101, Z-102, or Z-103.

(*e*) Slide cap O-124, O-125, or O-126 into place.

(*f*) Replace tube V-111 and socket assembly H-106 into r-f assembly. (Refer to paragraph 6.*c.* of this section.)

(3) REMOVAL OF FILTER Z-104.—To remove filter Z-104, slip off cap O-127, unsolder the lead to the terminal of Z-104, unscrew nut H-101, and withdraw the filter.

(4) REPLACEMENT OF FILTER Z-104.—To replace filter Z-104, proceed as follows:

(*a*) Make certain that hole in conductor E-102 for the pin plug of Z-104 is in a vertical position. If not, it can be re-oriented by inserting a 1/4-inch diameter rod in contact E-102B and rotating the fingers until the desired orientation is obtained. (E-102B is accessible from the tube end of the cavity when the oscillator tube V-111 and its socket assembly H-106 have been removed.)

(*b*) Plug filter Z-104 into place.

(*c*) Secure nut H-101.

(*d*) Resolder lead to terminal of Z-104.

(*e*) Slide cap O-127 into place.

(5) REMOVAL OF FILTER Z-105.—Removal of filter Z-105 is accomplished by unsoldering the lead to its terminal, unscrewing nut H-108, and taking out the filter.

(6) REPLACEMENT OF FILTER Z-105.—Replacement of filter Z-105 is accomplished by putting the filter in place, securing nut H-108, and soldering the lead to its terminal.

d. REFLECTOR TRACKING POTENTIOMETER R-185. (*See figure* 7-5.)—Potentiometer R-185 may be removed and replaced without removing the r-f assembly from the chassis.

(1) REMOVAL OF REFLECTOR TRACKING POTENTIOMETER.—To remove R-185 proceed as follows:

(*a*) Turn signal frequency knob fully clockwise.

(*b*) Unscrew nut H-101 (figure 7-7) and remove Z-104.

(*c*) Remove protective baffle and unsolder leads going to R-185 (figure 7-2).

(*d*) Loosen two set screws in chuck H-120 (figure 7-5).

(*e*) Remove three screws retaining R-185 and withdraw R-185.

(2) REPLACEMENT OF REFLECTOR TRACKING POTENTIOMETER.—To replace R-185, proceed as follows:

(*a*) Turn SIGNAL FREQUENCY knob fully clockwise.

(*b*) Take up two to three teeth on split gears O-115 and engage with pinion of gear assembly O-119. Be sure that gear is oriented so that set screws in chuck H-120 are accessible.

(*c*) Slip R-185 into place, engaging shaft in chuck H-120.

(*d*) Secure R-185 by means of the three mounting screws to the studs provided in back plate A-101.

(*e*) Locate wiper arm of R-185 1/4-inch from the fully counterclockwise end of the winding as viewed from the rear.

CAUTION

Do not force wiper arm up over edge of metal clamping strip.

(*f*) Secure the two recessed-head screws in chuck H-120.

(*g*) Solder leads to center and upper terminals of R-185. (It is immaterial which lead goes to which terminal.)

(*h*) Replace protective baffle on R-185.

(*i*) Replace Z-104.

(*j*) Perform tests described in paragraphs 7.*e*. and 8.*b*. of this section.

e. ATTENUATOR.

Note

If the attenuator is disassembled, recalibration of the power output according to the procedure described in paragraph 8.*c*. of this section is required. Disassembly must not be attempted by activities which do not possess adequate calibration facilities and test equipment.

(1) REMOVAL OF ATTENUATOR.—The attenuator piston O-107 and associated cable W-105 may be removed without removing the r-f assembly from the chassis. Proceed as follows:

(*a*) Remove support bar next to attenuator cable. (See figure 5-2.)

(*b*) Loosen two recessed-head screws in chuck O-110.

(*c*) Remove cable W-105 from chassis and panel as described in paragraph 10.*f*.(1) of this section.

(*d*) Withdraw attenuator piston O-106 and cable W-105 from tube Y-106 of the "T" assembly.

CAUTION

Do not attempt to disassemble the piston O-107 any further. If it is necessary to service the r-f output cable W-105 or the terminating resistor R-160, the entire piston assembly should be replaced; however, if emergency repair of this assembly is necessary, refer to paragraph 10.*e*.(2) of this section.

(2) EMERGENCY REPAIR OF PISTON ASSEMBLY.—Emergency repair of the piston assembly should only be resorted to if a complete replacement assembly is not available, and continued operation of the equipment is required. Proceed as follows:

(*a*) Check the resistance across the terminals of J-105. The resistance should be 51 ohms ±20 per cent; if not, check continuity of attenuator output cable W-105. This cable is subject to considerable flexing while the instrument is in use. If either the cable or the resistor requires replacement, a delicate soldering operation is involved.

(*b*) When performing a soldering operation on R-160, prevent the slightest amount of solder from coming in contact with the inside wall of O-107. This can be accomplished by temporarily inserting a piece of wet paper into O-107 at the pick-up end of R-160 where the soldering operation is to take place.

(3) REPLACEMENT OF ATTENUATOR.—Replacement of attenuator piston and associated cable should be carried out as follows:

(*a*) Insert attenuator piston O-107 into tube Y-106 of the "T" assembly.

CAUTION

Be certain the rack gear O-108 slips between the driving gear O-109 and loading spring H-114. This action is necessary to prevent unwanted backlash.

(*b*) Secure cable W-105 to chassis and panel following the procedure described in paragraph 10.*f*.(2) of this section.

(*c*) Replace support bar.

(*d*) Recalibrate power output according to the procedure outlined in paragraph 8.*c*. of this section, being sure to secure and seal the recessed-head set screws in chuck O-110 upon completion of adjustments.

f. REMOVAL AND REPLACEMENT OF R-F ASSEMBLY COMPLETE. (*See figures 5-2, 5-3, 5-3A, 5-3B, 5-3C, 5-3D, 7-3, 7-3A, 7-3B, 7-3C, and 7-7.*)

(1) REMOVAL OF R-F ASSEMBLY.—To remove the r-f assembly from the chassis, proceed as follows:

(*a*) Stand chassis on its back so that the front panel is facing upwards.

(*b*) Loosen the four screws holding C-120. Slide C-120 toward center of chassis.

(*c*) Unscrew the four small screws on the front panel which secure J-105. Remove J-105, and slip it, together with its cable, free of C-120.

(*d*) Unscrew nut H-111 and carefully slip cable W-105, together with J-105, through the hole in the chassis so that the entire cable assembly is now on the top of the chassis.

(*e*) Remove the two screws H-147 and H-148 holding cavity bracket O-105 to the chassis. They are located between V-113 and V-110.

(*f*) Remove the screw H-149 holding support post H-113 to the chassis. This screw is located between terminal board E-120 and V-114. Retrieve bushing H-165 which is now free.

(*g*) Place the chassis in its normal position with the front panel turned away.

(*h*) Remove protective baffle from R-185.

(*i*) Unsolder the wires leading to the following points: terminal E-107 of thermistor TH-101, terminals, E-108 and E-110 of thermistor TH-102, the terminal of filter Z-104, and the two leads to the reflector variable resistor R-185. (See figures 7-2, 7-2A, B, C, and D.)

(*j*) Remove oscillator tube V-111 and its socket assembly H-106. (Refer to paragraph 6.*c*. of this section.)

(*k*) Disconnect flexible shaft O-113 by loosening the two recessed-head screws in the chuck behind the front panel that connects the POWER SET knob to flexible shaft O-113.

(*l*) Turn the SELECTOR SWITCH to SIN SYNC position. Disconnect the selector switch knob shaft from S-101 by loosening the two set screws in the chuck.

(*m*) Remove the SIGNAL FREQUENCY and OUTPUT ATTENUATOR knobs.

(*n*) Remove the screws H-132 through H-137 that secure the r-f assembly to the front panel.

(*o*) Loosen the three screws retaining meter M-101 until meter can be pulled forward one inch.

(*p*) The r-f assembly is now ready to be withdrawn as a unit from the chassis proper. Slide it back from the panel as far as the tubes will permit.

CAUTION

The wire leads running to the panel meter and ZERO SET potentiometer along the rear of the front panel should be carefully drawn toward the panel and clear of the attenuator dial to prevent possible damage to insulation before proceeding with the following steps.

(*q*) Lift out the r-f assembly by lifting the dial end up first and moving the whole assembly forward and out at about a 45-degree angle. Do not force the unit out. If all obstructions are cleared, it will come freely.

(2) REPLACEMENT OF R-F ASSEMBLY.—To replace the r-f assembly, proceed as follows:

CAUTION

Because of the close fit of electron tubes and wires, and the possibility of defacing dials, care must be exercised in replacing the r-f assembly.

(*a*) Remove socket assembly H-106 and tube V-111 from the r-f assembly. (Refer to paragraph 6.*c*. of this section.)

(*b*) Lift the r-f assembly, tilting the back end of the cavity downward at about a 45-degree angle and slipping it under the rear guard rail. Lower the dial end of the cavity, and slide the assembly into place.

Note

Be sure to get the wire leads to the meter and ZERO SET potentiometer behind the attenuator dial. When bringing the SIGNAL FREQUENCY and OUTPUT ATTENUATOR shafts through the holes in the front panel, make certain that the appropriate locking yokes located on the back of the front panel are properly engaged.

(*c*) Start the screws H-132 through H-137 that secure the r-f assembly to the front panel. After making certain that the hubs on the SIGNAL FREQUENCY and OUTPUT ATTENUATOR shafts are centered in the front panel holes, tighten the screws.

(*d*) Secure the three screws which retain meter M-101.

(*e*) Connect flexible shaft O-113 to the chuck behind the front panel and secure with recessed-head screws.

(*f*) Install and secure SIGNAL FREQUENCY and OUTPUT ATTENUATOR knobs. On signal generators with an interpolation scale on the SIGNAL FREQUENCY knob, this scale must be so oriented that its zero coincides with one of the separating lines on the counting scale of the MC (signal frequency) dial. This orientation can only be made after setting the SIGNAL FREQUENCY dial calibration as described in paragraph 8.*b*. of this section.

(*g*) Secure the knob shaft to the SELECTOR SWITCH shaft by tightening the two recessed-head screws in the chuck on the knob shaft, making certain that both shafts are in the SIN SYNC position (fully clockwise).

(*h*) Solder the two wires leading to the reflector potentiometer R-185, using the center and upper terminals of the resistor. It is immaterial which wire goes to which terminal. Solder the leads going to terminal E-107 of thermistor TH-101, terminals E-108 and E-110 of thermistor TH-102, terminals E-108 and E-110 of thermistor TH-102, and to the terminal of filter Z-104. Slip cap O-127 over the terminal of Z-104.

(*i*) Replace the protective baffle on R-185.

(*j*) Install oscillator tube V-111 and socket assembly H-106. (Refer to paragraph 6.*c*. of this section.)

(*k*) Stand the chassis on its back so that the front panel is facing upward.

(*l*) Secure the cavity mounting bracket O-105 to the chassis with screws H-147 and H-148.

(*m*) Install bushing H-165 between post H-113 and chassis, and secure with screw H-149.

(*n*) Slip W-105 through the hole provided in chassis, and position the anti-turn pin on H-110 in the

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locating slot and secure H-111. Insert J-105 into the hole provided on the front panel and secure with the four small screws provided. Give proper slack to W-105 before securing H-109. A rubber insert contained in H-109 squeezes W-105 to prevent "cable walking." (See figure 7-7.)

(*o*) Slide C-120 over W-105 and secure C-120 with the four screws provided. C-120 should clear the side of the chassis by approximately 1/16 inch.

g. "T" ASSEMBLY.

(1) GENERAL.—The "T" assembly A-107 should not ordinarily require servicing. Most troubles associated with the output system of the signal generator are traceable either to the thermistor power monitoring system or to the attenuator, maintenance of which is discussed in paragraphs 10.*b* and 10.*e*., this section. These operations do not require removal of the "T" assembly. Operation of the drive mechanism for power take-off probe C-129 may be inspected by removing screw plug H-122 without removing the "T" assembly.

(2) REMOVAL OF "T" ASSEMBLY.—If it is desired to remove the entire "T" assembly from the cavity proper, it will be necessary to remove the r-f assembly from the chassis (paragraph 10.*f*., this section). Proceed as follows:

(*a*) Remove the screw from the front of the back plate A-101 that secures attenuator horizontal support shaft H-112.

(*b*) Loosen the two recessed-head screws in chuck O-110.

(*c*) Unscrew nut H-107.

(*d*) Carefully lift the "T" from the cavity, rotating it slightly about shaft O-111 as an axis, until tube E-104 is free of cavity Y-102, and then pulling away from back plate A-101 until shaft O-111 is free.

CAUTION

After removal be certain to lay the "T" on the bench upside down so that the piston drive gearing O-108 and O-109 faces upward. This action will prevent possible damage to the thermistor terminals and the r-f power take-off C-129.

(3) REPLACEMENT OF "T" ASSEMBLY.—To replace the "T" assembly proceed as follows:

(*a*) If attenuator piston O-107 has been removed, insert it into tube Y-106 of the "T" assembly.

CAUTION

Be certain the rack gear O-108 slips between the driving gear O-109 and loading spring H-114. This action is necessary to prevent unwanted backlash.

(*b*) Engage chuck O-110 and shaft O-111.

(*c*) Carefully insert the "T" assembly into the vertical hole at the tube end of the cavity Y-102.

(*d*) Secure the screw that holds the attenuator horizontal support shaft H-112 to the rear of the back plate A-101.

(*e*) Secure nut H-107.

CAUTION

Before two screws in chuck O-110 can be tightened, it will be necessary to replace the r-f assembly (refer to paragraph 10.*f*., this section) and perform the output attenuator calibration described in paragraph 8.*c*., this section.

h. POWER TAKE-OFF PROBE.

CAUTION

Do not dismantle the power take-off probe C-129, or the coupling line attached thereto. This particular assembly has been carefully matched and set at the factory, and should not require servicing. Inspection of the drive mechanism is possible after removal of the metal screw plug H-146. (See figure 7-7.) This mechanism cannot be serviced without special tools.

i. DISASSEMBLY AND REASSEMBLY OF DIALS AND GEARS. (*See figure* 7-5.)—To disassemble the frequency and attenuator dials with attendant gears, it is necessary first to remove the r-f assembly from the chassis proper. (Refer to paragraph 10.*f*., this section.)

CAUTION

Removal of either dial assembly will necessitate recalibration of the instrument. Disassembly must not be attempted by activities which do not possess adequate calibration facilities and test equipment.

(1) REMOVAL OF SIGNAL FREQUENCY DIAL.—To remove the signal frequency dial N-101 and associated gears, proceed as follows:

(*a*) Crank the signal frequency worm shaft O-101 fully clockwise. It will be necessary to install the signal frequency knob E-151 temporarily in order to do this.

(*b*) Remove hub H-116 and associated washers H-150, H-173, and H-131.

(*c*) Withdraw dial assembly N-101.

Note

If worm shaft O-101 has been burred by the set screws in hub H-116, do not attempt to force N-101 off. Remove burrs with a small file sufficiently to permit easy withdrawal of N-101 dial assembly.

(*d*) Remove washers H-130 and H-172.

(*e*) Remove clip H-121 by first prying bump from its locating hole with a small screw driver and then withdrawing clip radially.

(*f*) Loosen the two recessed-head screws in hub H-120.

(*g*) Withdraw gear assemblies O-115 and O-119 simultaneously.

(2) REASSEMBLY OF SIGNAL FREQUENCY DIAL.—Reassembly of signal frequency dial N-101 and associated gears should be carried out after lubrication as outlined in table 4-1. Proceed as follows:

(*a*) Install the signal frequency knob E-151 temporarily and crank the signal frequency worm shaft fully clockwise.

(*b*) Wind up spring-loaded gears O-115 by two-to three teeth and mesh with pinion on gear assembly O-119.

CAUTION

Chuck H-120 must be so oriented when performing steps (*b*), (*c*), and (*d*) that the recessed-head screws are accessible for tightening.

(*c*) Wind up spring-loaded gears on gear assembly O-119 and mesh with spline on worm shaft O-101.

CAUTION

Do not install spring clip H-121 until called for in step (*g*) below.

(*d*) Slide shaft of gear assembly O-119 into hole provided in mounting plate A-101, and simultaneously slide chuck H-120 over shaft of potentiometer R-185.

(*e*) Locate wiper arm of R-185 in the fully counterclockwise position as viewed from the rear. Do not force wiper arm up over edge of metal clamping strip.

(*f*) Secure the two recessed-head screws in chuck H-120.

(*g*) Install clip H-121, being sure to seat the bump in its locating hole.

(*h*) Install washers H-130 and H-172.

(*i*) Slip dial face counterclockwise relative to the three studs at its center so that the studs are as far clockwise as possible in the slots in the dial face.

(*j*) With the 900 scale mark in a vertical position, slip signal frequency dial N-101 on shaft O-101, take up two to three teeth on split gears, and mesh with pinion of gear assembly O-119.

CAUTION

If for any reason, worm shaft O-101 has been burred so as to prevent N-101 from sliding freely into place, the burrs must be removed before attempting step (*j*). Do not force N-101 onto shaft O-101.

(*k*) Slip dial face clockwise until the three central studs are approximately centered in their slots.

(*l*) Install large flat washer H-131, followed by the two small washers H-173 and H-150.

(*m*) Slip hub H-116 onto worm shaft O-101 until it exerts noticeable pressure on the washer pile-up; then secure the two recessed-head screws.

(3) REMOVAL OF OUTPUT ATTENUATOR DIAL.—Remove attenuator dial N-102 and associated gears as follows:

(*a*) Crank the attenuator pinion shaft O-118 fully clockwise.

(*b*) Remove hub H-117 and associated washers H-129 and H-171.

(*c*) Withdraw dial N-102.

Note

If attenuator pinion shaft O-118 has been burred by the set screws in hub H-117, do not attempt to force N-102 off. Remove burrs with a small file sufficiently to permit easy withdrawal of N-102 dial.

(*d*) Remove washers H-128 and H-170.

(*e*) Gear assembly O-116 may be withdrawn after loosening the two recessed-head screws in chuck O-112 nearest the back plate, A-101. Washers H-151 and H-152 are now free and should be carefully laid aside to prevent loss.

(*f*) Attenuator pinion shaft O-118 may be removed by first loosening the two recessed-head screws in hub H-118 and withdrawing the shaft. This will free tumblers H-119A through H-119K, washers H-126 and H-167, hub H-118, and washers H-127, H-168, and H-169. These parts should be carefully laid aside to prevent loss.

(4) REASSEMBLY OF ATTENUATOR DIAL.—Reassemble attenuator dial N-102 and associated gears as follows:

(*a*) Install washers H-127, H-168, and H-169 on the long end of pinion shaft O-118, slip pinion shaft into its bushing in A-101, install tumblers H-119A through H-119K, install washers H-126 and H-167 with the convex sides toward the end of the shaft, and install hub H-118.

(*b*) Install washer H-151 on shaft of gear assembly O-116, take up two to three teeth on split gears O-116, and slip shaft into its bushing while meshing gears with pinion on O-118. Install washer H-152 on end of shaft O-116, protruding through its bushing. Shaft should engage chuck O-112. Secure the two recessed-head screws on chuck O-112 nearest the plate A-101.

(*c*) Install washers H-128 and H-170 on pinion shaft O-118, slip dial N-102 onto shaft, take up two to three teeth on split gears of dial, and mesh with solid gear of O-116 gear assembly.

Note

If, for any reason, pinion shaft O-118 has been burred so as to prevent N-102 from sliding freely into place, the burrs must be removed before attempting step (*c*). Do not force dial N-102 onto shaft O-118.

(*d*) Install curved washers H-129 and H-171 with their convex sides together.

(*e*) Install hub H-117 with sufficient end pressure to compress curved washers H-129 and H-171. Secure the two recessed-head screws.

(*f*) Set the stop mechanism on the attenuator dial as follows:

1. Temporarily loosen recessed-head screws in hub H-118.

2. Turn shaft O-118 until the −3 dbm scale line on the dial N-102 is exactly vertical.

3. Turn hub H-118 counterclockwise as viewed from the rear until tumblers offer a positive stop.

4. Shaft O-118 should rest firmly against its bushing, hub H-118 should be pushed up so as to compress spring washers H-126A and H-126B, and shaft O-118 may then be secured by means of the two recessed-head screws.

j. DISASSEMBLY AND REASSEMBLY OF CAVITY ASSEMBLY. *(See figure 7-7.)*

CAUTION

Do not attempt to disassemble the cavity proper without proper maintenance facilities. Although the parts can withstand normal handling, careful attention to alignment is required in reassembly.

(1) GENERAL.—Disassembly of the cavity may become necessary if pulsed or cw operation of Signal Generator TS-419/U becomes erratic as the SIGNAL FREQUENCY control is tuned. Trouble of this nature usually occurs near the high-frequency end of the tuning range, and is manifested primarily by erratic pulsing when performing the tests described in paragraph 7.*e*. of this section. Such trouble is usually due to a weak oscillator tube V-111; rotation or replacement of this tube (paragraph 6.*c*. of this section) should be tried prior to more serious measures. If tube replacement does not clear the trouble, it may be necessary to disassemble the cavity in order to clean dirty or corroded parts.

Note

On all components manufactured under Co
tracts NOa(s)-9748, NOa(s)-12279, N383
60879, N383s-61060, N383s-75748, N383
77651, and in the TS-419A/U (Contrac
N383s-16939A, N383-31275A, and N383
46093A), all cavity parts are silver plated. I
equipments of Contracts N383s-5019A, N383
45741, and N383s-67816, parts E-101A, Y
101A/B, and Y-102 are gold plated. (Gold
plated parts are highly resistant to corrosio
and require no protective lacquer.)

(2) DISASSEMBLY OF CAVITY ASSEMB
It is possible to partially disassemble the cavity
the r-f assembly has been removed from the
(paragraph 10.*f*. of this section) without removi
dials or gears. Such partial disassembly will
most cleaning operations to be performed. Proc
follows:

(*a*) Remove tube V-111 and socket as
H-106 as described in paragraph 6.*c*. of this section

(*b*) Turn power set shaft O-131 fully co
clockwise.

(*c*) Remove "T" assembly as described in
graph 10.*g*.(2) of this section.

(*d*) Unscrew nut H-101 and remove filter

(*e*) Remove screws H-102, H-103, H-104,
H-163, and H-164 from the cavity barrel.

(*f*) Withdraw cavity barrel Y-102 fro
remainder of the assembly.

CAUTION

Exercise extreme care in handling the expos
parts of the cavity since contact fingers m
easily be bent.

(3) INSPECTION OF CAVITY ASSEMB
Inspect the cavity assembly as follows:

(*a*) The inside of barrel Y-102 should s
least one longitudinal mark for each finger on
ring E-101. Each mark should extend for a d
corresponding to the full travel of E-101. Mar
be slightly irregularly spaced, but none should b
ing. If any mark is missing, the associated fin
E-101 should be bent out slightly. Do not ben
finger to produce a permanent set in excess of
inch. (Refer to paragraph 10.*j*.(4)(*c*) of this se

(*b*) Make sure there are no small glas
inside barrel Y-102.

(*c*) If there are any deep pits or scars
Y-102, or if it has been bent or dented by accid
should be replaced.

(*d*) Examine worm shaft O-101 and worm
ing O-102 for looseness. If maintenance beyond c
and relubrication is required, complete cavity dis
bly is necessary. Clean and lubricate worm O-101,
bearing O-102, and ball bearings.

(4) CLEANING CAVITY ASSEMBLY.—To clean the cavity assembly detail parts, proceed as follows:

(*a*) The inside of barrel Y-102 should be thoroughly wiped with a *clean* cloth soaked in acetone. Pay particular attention to area between aperture mounting filter Z-104 and contact fingers E-103. Coat inside of barrel *very lightly* with Eclipse Pioneer PO-10 oil (AN Specification AN-O-11).

CAUTION

Avoid contact of cleaning solvents with outside silver surfaces of cavity as these have been lacquered to protect the silver plating from corrosion. (Refer to note of paragraph 10.*j*.(1), this section.)

(*b*) Conductor Y-101A and contact ring Y-101B should be cleaned using a cloth soaked in acetone. If any gum or residue persists, it should be removed by gentle use of crocus cloth. Blow any residue free with a stream of compressed air.

CAUTION

Use crocus cloth with extreme care as this is a cleaning operation only. The plating must not be removed.

(*c*) The outer ring of contact fingers of E-101A may be cleaned with crocus cloth until bright. Do not apply excessive pressure which might deform these delicate fingers. The outside diameter should be 1.530 ±0.010 inches, and should be concentric with conductor Y-101A to within 0.005 inch.

(5) REMOVAL AND REPLACEMENT OF Y-101.—Removal of conductor Y-101 is required if conductor E-102 requires attention or if the inner fingers of E-101 are to be cleaned. These operations are rarely required, and Y-101 should not normally be removed unless either it or conductor E-102 requires replacement due to mechanical damage. If required, proceed as follows:

(*a*) Unscrew the three small screws going radially into support block O-104, and withdraw Y-101 carefully.

(*b*) The inside fingers of contact ring E-101 should be cleaned with crocus cloth until bright. Do not apply excessive pressure which might deform these delicate fingers. Blow any dust free with compressed air.

(*c*) To replace Y-101, insert conductor assembly E-102 in Y-101, and push Y-101 through the inner fingers of contacting ring E-101 into place in support block O-104. Y-101 must be so positioned that the three tapped holes in it line up with those in support block O-104. Orient the assembly so that Y-101 assumes a vertical position with finger Y-101B at the top. This permits E-102 to drop into its proper position. Start the three radial screws through support block O-104 into Y-101.

CAUTION

It is essential that Y-101 be held firmly and squarely seated in O-104 in order to maintain the required alignment while the retaining screws are tightened. When the screws are tight, they should be sealed with enamel. Conductor E-102 should have radial float and endwise play of at least 1/64 inch when properly installed.

(6) REASSEMBLY OF Y-102.—To reassemble barrel Y-102 to cavity, proceed as follows:

(*a*) Start barrel over contact ring fingers E-101. This may be facilitated somewhat by cocking the barrel slightly, starting fingers on one side first, and gradually working the others in, gently compressing the last few with the fingers of one hand if necessary.

(*b*) Slide barrel down into place, depressing the fingers of E-101 as they pass the hole in which filter Z-104 seats. Barrel should be slid until stopped by mounting plate A-101.

CAUTION

Do not under any circumstances force barrel Y-102 past any apparent obstruction. If more than gentle pressure is applied, serious damage to the cavity may result.

(*c*) Orient barrel so that hole for filter Z-104 lines up with hole in support block O-104. Replace filter Z-104 as described in paragraph 10.*c*.(4), this section.

(*d*) Slip stem of "T" assembly into its aperture in barrel Y-102, and secure nut H-107.

(*e*) Install and secure the three screws H-102, H-103, and H-104.

(*f*) Install and secure the three screws H-162, H-163, and H-164.

(7) REMOVAL OF CAVITY ASSEMBLY.—Remove cavity assembly A-106 from r-f assembly A-105 as follows:

(*a*) Remove r-f assembly A-105 from chassis as described in paragraph 10.*f*.(1) of this section.

(*b*) Remove "T" assembly A-107 from r-f assembly A-105 as described in paragraph 10.*g*.(2) of this section.

(*c*) Remove frequency dial N-101 and associated gears from r-f assembly A-105 as described in paragraph 10.*i*.(1) of this section.

(*d*) Remove three flat-head screws retaining cavity assembly A-106 to mounting plate A-101.

(8) REPLACEMENT OF CAVITY ASSEMBLY. —Replace cavity assembly A-106 in r-f assembly A-105 as follows:

(*a*) Put cavity assembly A-106 in place against mounting plate A-101, and secure with three flat-head screws.

(*b*) Replace frequency dial N-101 and associated gears as described in paragraph 10.*i*.(2) of this section.

(*c*) Replace "T" assembly A-107 as described in paragraph 10.*g*.(3) of this section.

(9) COMPLETE DISASSEMBLY OF CAVITY ASSEMBLY.—Complete disassembly of the cavity assembly A-106 is a major operation which should be attempted only if worm shaft O-101 or its bearings have been so damaged as to require maintenance. Disassembly of the tuning mechanism is not recommended since extreme care is required in reassembly to secure satisfactory operation with a minimum of backlash and yet without binding. Certain special shim washers have been added during original assembly by the manufacturer to obtain the required performance. Relative positions and tightness of all parts must be maintained. If disassembly is attempted, mark all parts to insure that they are replaced in *exactly* their original orientation and position. Complete disassembly is possible only after removal of cavity assembly A-106 from r-f assembly A-105 as described in paragraph 10.*j*.(7) of this section.

10A. REMOVAL AND REPLACEMENT OF SELECTOR SWITCH S-101.

Note

> Maintenance personnel are cautioned against unnecessary removal of the selector switch S-101. Before removal, check the possibility of defective wire lead connections by making a direct continuity check of all wiring, using Multimeter TS-352/U. It should also be noted that replacement switches supplied under Contracts N383s-60879 and N383s-61060 are furnished with all leads pre-cut and soldered to the switch, while those under Contracts N383s-5019A, NOa(s)-9748, NOa(s)-12279, N383s-45741, N383s-67816 and in the TS-419A/U equipments are supplied without wiring. Under Contracts N383s-75748 and N383s-77651 they may be furnished either way. Follow removal and replacement procedures carefully.

a. REMOVAL OF SELECTOR SWITCH S-101.—To remove the selector switch S-101, proceed as follows:

(1) Remove the switch cover, which is held in place by a front and rear detent, by pulling it up, and remove the insulating cover which is over the switch.

(2) All wires leading to the switch through the holes lettered D, E, F, and G on wiring diagrams, figures 7-2, 7-2A, 7-2B, 7-2C, 7-2D, 7-3. 7-3A, 7-3B, 7-3C, must be unsoldered at their terminal points on the underside the chassis.

(3) Loosen the two set screws in the sha coupling behind the front panel, and pull the knob a shaft forward.

(4) Loosen the switch lock nut and remove it an the associated lock washers.

(5) To remove the switch, lift the front ends the switch up and forward.

b. REPLACEMENT OF SELECTOR SWITCH S-10 —To replace the selector switch S-101, proceed follows:

(1) If the replacement switch is unwired (refer preceding note), see figure 7-3, 7-3A, 7-3B or 7-3C, (refe to note which follows), and prewire the switch, usin the switch which is being replaced as a model from whic lead lengths and wire dressing are copied. Leads mu be dressed into four groups corresponding to the hol through which they pass to the underside of the chassi

Note

> In equipments of Contract NOa(s)-9748 (and also N383s-60879, N383s-61060, N383s-75748, and N383s-77651), and in the TS-419A/U, a four-wire group was brought through hole "G" (see figures 7-3, 7-3B and 7-3C). In equipments of Contracts N383s-5019A, N383s-45741, and N383s-67816, a three-wire group was used (see figure 7-3A). These changes involved the "L. GREEN" and "D. BLUE" wires. The contract number of the equipment under repair should be checked and the corresponding wiring diagram used.

(2) If a pre-wired switch is being used for replac ment (refer to preceding note), notice that the fou wire groups are individually marked with an alphabeti tag, except on Contracts N383s-75748 and N383s-7765 The letters used correspond to the holes marked a shown on figure 7-3.

(3) Feed the proper wire group through its co responding chassis hole (see figure 7-3) and set th switch into position on its mount by dropping the re end in first and then the shaft end.

(4) Resolder the leads to the appropriate poin on the underside of the chassis in accordance with th appropriate wiring diagram, figure 7-2, 7-2A, 7-2B, 7-2 or 7-2D, depending on the contract number of the equi ment.

(5) Secure the switch by replacing the lock washe and tightening the lock nut on the shaft.

(6) Insert the selector switch knob and sha through the front panel hole until the coupling engag the switch shaft. Tighten the two set screws in th coupling.

(7) Place the insulating cover over the switch, a replace the aluminum switch cover, pressing do lightly until the detents are engaged.

(8) Check the operation of the selector switch by following any one of the operating procedures described in paragraph 6. of Section II.

11. VOLTAGE MEASUREMENTS.

Nominal voltage values obtained at tube socket terminals of Signal Generator TS-419/U, under the conditions noted, will be found in table 4-5.

WARNING

When measuring voltages on V-111, V-112, V-113, V-117, V-118, V-119, or V-120 observe all safety regulations. These vacuum tubes have applied potentials which are dangerous and may be fatal if contacted.

TABLE 4-5. VOLTAGE MEASUREMENTS

NOTES:
1. All voltage measurements made with SELECTOR SWITCH in NEG SYNC position.
2. All voltages dc, unless otherwise indicated, tolerance ±10%, and are effective for all equipments unless otherwise specified. (Refer to Note 7.)
3. All measurements made with respect to −325 volt supply line (any red lead), unless followed by asterisk (*); such annotated values are measured with respect to chassis.
4. Multimeter TS-352/U used for 20,000 ohms-per-volt measurements. Alternates: Simpson Model 260, Navy Model OE, or Weston Model 790.
5. Multimeter TS-297/U used for 1000 ohms-per-volt measurements. Alternates: Simpson Model 443 or Weston Model 663.
6. Nominal primary power input, measured with Voltmeter IS-185, 115 volts, 50 to 1600 cps, single phase.
7. Voltage value in parentheses applies to equipments of Contracts N383s-5019A, N383s-45741, and N383s-67816; other value is for equipments of Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651, and the TS-419A/U equipments.

Test Point		*20,000 Ohms-per-Volt Meter*		*1000 Ohms-per-Volt Meter*	
Reference Symbol	*Terminal Number*	*Meter Scale*	*Voltage*	*Meter Scale*	*Voltage*
V-101 (JAN-7F8W)	1	1000	80	——	——
	2	10	6.3 AC	10	6.3 AC
	3	250	—80*	1000	—80*
	4	250	80	1000	80
	5	1000	280	1000	280
	6	250	0*	250	0*
	7	250	0	250	0
	8	1000	275	——	——
V-102 (JAN-7F8W)	1	1000	100	1000	100
	2	10	6.3 AC	10	6.3 AC
	3	250	−185*	1000	−185*
	4	250	100	1000	100
	5	250	100	1000	100
	6	250	0*	250	0*
	7	250	0	250	0
	8	250	85	1000	80
V-103 (JAN-7F8W)	1	250	0*	250	0*
	2	10	6.3* AC	10	6.3* AC
	3	250	0*	250	0*

TABLE 4-5. VOLTAGE MEASUREMENTS (Cont.)

Test Point		*20,000 Ohms-per-Volt Meter*		*1000 Ohms-per-Volt Meter*	
Reference Symbol	*Terminal Number*	*Meter Scale*	*Voltage*	*Meter Scale*	*Voltage*
V-103 (JAN-7F8W) (Cont.)	4	250	0*	250	0*
	5	250	0*	250	0*
	6	250	0*	250	0*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-104 (JAN-7F8W)	1	50	19	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	−170* (−145*) (Note 7)	250	−170* (−145*) (Note 7)
	4	50	17 (19) (Note 7)	100	17 (19) (Note 7)
	5	50	17 (19) (Note 7)	100	17 (19) (Note 7)
	6	250	0*	250	0*
	7	250	0	250	0
	8	250	0	250	0
V-105 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	0*	250	0*
	4	250	0*	250	0*
	5	250	0	250	0
	6	—	—	—	—
	7	250	0	250	0
	8	250	50	250	50
V-106 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	0*	250	0*
	4	250	0* (58) (Note 7)	250	0* (58) (Note 7)
	5	1000	−60 (−21) (Note 7)	—	−45 (−19) (Note 7)
	6	— (250)	— (58) (Note 7)	— (250)	— (58) (Note 7)
	7	250	0	250	0
	8	250	0	250	0
V-107 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	−100*	250	−100*
	4	250	90	250	85
	5	250	0	250	0
	6	250	90	250	85
	7	250	0	250	0
	8	250	0	250	0

TABLE 4-5. VOLTAGE MEASUREMENTS (Cont.)

Test Point		*20,000 Ohms-per-Volt Meter*		*1000 Ohms-per-Volt Meter*	
Reference Symbol	*Terminal Number*	*Meter Scale*	*Voltage*	*Meter Scale*	*Voltage*
V-108 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	0*	250	0*
	4	250	0*	250	0*
	5	1000	−60	1000	−50
	6	—	—	—	—
	7	250	0	250	0
	8	250	0	250	0
V-109 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3 AC	10	6.3 AC
	3	250	0*	250	0*
	4	250	0*	250	0*
	5	250	0	250	0
	6	250	0	250	0
	7	250	0	250	0
	8	50	37.5	50	36
V-110 (JAN-7F8W)	1	1000	−300	1000	−300
	2	10	6.3 AC	10	6.3 AC
	3	1000	−300	1000	−300
	4	250	0	250	0
	5	250	0	250	0
	6	1000	−300	1000	−300
	7	250	0	250	0
	8	1000	−300	1000	−300
V-111 (JAN-6BM6A)	1	1000	−300	1000	−300
	2	250	0	250	0
	3	250	0	250	0
	4	10	6.3 AC	10	6.3 AC
V-112 (JAN-5R4GY or MIL-5R4WGA)	1	—	—	—	—
	2	10	5.0 AC (to term No. 8)	10	5.0 AC (to term No. 8)
	3	—	—	—	—
	4	1000	680 AC	1000	680 AC
	5	—	—	—	—
	6	1000	680 AC	1000	680 AC
	7	—	—	—	—
	8	1000	240*	1000	240*

TABLE 4-5. VOLTAGE MEASUREMENTS (Cont.)

Test Point		20,000 Ohms-per-Volt Meter		1000 Ohms-per-Volt Meter	
Reference Symbol	Terminal Number	Meter Scale	Voltage	Meter Scale	Voltage
V-113 (JAN-5R4GY or MIL-5R4WGA)	1	—	—	—	—
	2	10	5.0 AC (to term No. 8)	10	5.0 AC (to term No. 8)
	3	—	—	—	—
	4	1000	−925	1000	−925
	5	—	—	—	—
	6	1000	−925	1000	−925
	7	—	—	—	—
	8	1000	680 AC	1000	680 AC
V-114 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3* AC	10	6.3* AC
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	−15*	100	−14.5*
	6	50	−15*	100	−14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-115 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3* AC	10	6.3* AC
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	−15*	100	−14.5*
	6	50	−15*	100	−14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-116 (JAN-6V6GTY)	1	—	—	—	—
	2	10	6.3* AC	10	6.3* AC
	3	1000	225*	1000	225*
	4	1000	225*	1000	225*
	5	50	−15*	100	−14.5*
	6	50	−15*	100	−14.5*
	7	250	0*	250	0*
	8	250	0*	250	0*
V-117 (JAN-0A2 or MIL-0A2WA)	1	1000	−450	1000	−450
	2	1000	−600	1000	−600
	3	—	—	—	—
	4	1000	−600	1000	−600

TABLE 4-5. VOLTAGE MEASUREMENTS (Cont.)

Test Point		*20,000 Ohms-per-Volt Meter*		*1000 Ohms-per-Volt Meter*	
Reference Symbol	*Terminal Number*	*Meter Scale*	*Voltage*	*Meter Scale*	*Voltage*
V-117 (JAN-0A2) (Cont.)	5	1000	−450	1000	−450
	6	—	—	—	—
	7	1000	−600	1000	−600
V-118 (JAN-0A2 or MIL-0A2WA)	1	1000	−300	1000	−300
	2	1000	−450	1000	−450
	3	—	—	—	—
	4	1000	−450	1000	−450
	5	1000	−300	1000	−300
	6	—	—	—	—
	7	1000	−450	1000	−450
V-119 (JAN-0A2 or MIL-0A2WA)	1	1000	−150	1000	−150
	2	1000	−300	1000	−300
	3	—	—	—	—
	4	1000	−300	1000	−300
	5	1000	−150	1000	−150
	6	—	—	—	—
	7	1000	−300	1000	−300
V-120 (JAN-0A2 or MIL-0A2WA)	1	1000	0	1000	0
	2	1000	−150	1000	−150
	3	—	—	—	—
	4	1000	−150	1000	−150
	5	1000	0	1000	0
	6	—	—	—	—
	7	1000	−150	1000	−150
V-121 (JAN-7F8W)	1	250	155	1000	155
	2	10	6.3 AC	10	6.3 AC
	3	50	−15*	100	−14*
	4	1000	170	1000	170
	5	250	0	250	0
	6	1000	170	1000	170
	7	250	0	250	0
	8	50	−4.5	1000	0
V-122 (JAN-0A2 or MIL-0A2WA)	1	250	0*	250	0*
	2	250	−150*	250	−150*
	3	—	—	—	—
	4	250	−150*	250	−150*
	5	250	0*	250	0*
	6	—	—	—	—
	7	250	−150*	250	−150*

12. RESISTANCE MEASUREMENTS.

Nominal resistance measurements made at tube socket terminals of Signal Generator TS-419/U, under the conditions noted, will be found in table 4-6.

13. COIL WINDING DATA.

Coil winding data, including resistance values where applicable, are listed in table 4-7. These data will be found useful in testing the coils and transformers used in Signal Generator TS-419/U.

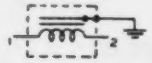
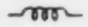
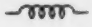
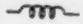
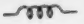
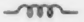
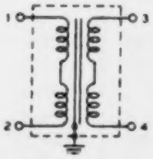
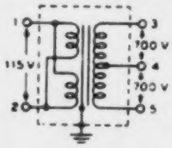
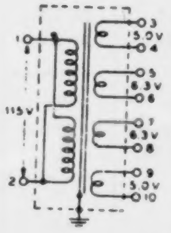
TABLE 4-6. RESISTANCE MEASUREMENTS

NOTES:

1. All resistance measurements made with SELECTOR SWITCH in NEG SYNC position.
2. All resistance values in ohms unless followed by "K"—kilohm (1000 ohms) or "Meg"—megohm (1,000,000 ohms), tolerance ±10%. These values are effective for all equipments unless otherwise specified. (Refer to Note 8.)
3. All measurements made with respect to −325 volt supply line (any red lead), unless followed by asterisk (*); such annotated values are measured with respect to chassis.
4. This measurement varies from 3.0 K to 1 Meg, with respect to −325 volt supply line (any red lead), depending on the setting of the PULSE DELAY control.
5. This measurement varies from approximately 1 K to 100 K, with respect to chassis, depending on the setting of the PULSE WIDTH control.
6. This measurement varies from approximately 100 K to 250 K, with respect to chassis, depending on the setting of the SIGNAL FREQUENCY control.
7. Multimeter TS-352/U used for all resistance measurements. Alternates Simpson Model 260, Navy Model OE, or Weston Model 790.
8. Resistance value in parentheses applies to equipments of Contracts N383s-5019A, N383s-45741, and N383s-67816; other value is for equipments of Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, N383s-61060, N383s-75748, and N383s-77651 and the TS-419A/U equipments.

Reference Symbol	*Terminal Number*							
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
V-101	1 Meg	0	10 K*	10 K	47 K*	100 K*	0	1.1 Meg
V-102	200 K*	0	33 K*	14 K	14 K	100 K*	0	54 K
V-103	15 K*(33 K*) (Note 8)	0	15 K*(33 K*) (Note 8)	0*	15 K*	33 K*	0*	33 K*
V-104	Note 4	0	15 K*	1.5 K(2 K) (Note 8)	1.5 K(2 K) (Note 8)	33 K*	0	0
V-105	—	0	0*	47*	100 K	—	0	19 K
V-106	—	0	15 K*	47*(1.5 K) (Note 8)	350 K(200 K) (Note 8)	−(1.5 K) (Note 8)	0	0
V-107	—	0	3 K*	150 K*	Note 5	150 K*	0	0
V-108	—	0	5*	47*	220 K(165 K) (Note 8)	—	0	0
V-109	—	0	0*	47*	100 K	100 K	0	22 K
V-110	—	0	—	0	0	—	0	—
V-111	—	0	0	0	—	—	—	—
V-112	—	—	—	120	—	140	—	—
V-113	—	140	—	Note 6	—	Note 6	—	140
V-114	—	0*	—	—	33 K*	33 K*	0*	0*
V-115	—	0*	—	—	33 K*	33 K*	0*	0*
V-116	—	0*	—	—	33 K*	33 K*	0*	0*
V-117	—	Note 6	—	Note 6	—	—	Note 6	—
V-118	—	—	—	—	—	—	—	—
V-119	130 K(80 K) (Note 8)	—	—	—	130 K(80 K) (Note 8)	—	—	—
V-120	0	130 K(80 K) (Note 8)	—	130 K(80 K) (Note 8)	0	—	130 K(80 K) (Note 8)	—
V-121	110 K*	0	33 K*	—	0	—	0	1.15 Meg*
V-122	0*	4.5 K	—	4.5 K	0*	—	4.5 K	—

TABLE 4-7. COIL WINDING DATA

Symbol Designation	Aircraft Radio Corp Part Number	Diagram	Winding	Wire Size	Turns	Resistance in Ohms		AC Test Volts RMS	Remarks
						Pin	At 20° C (68° F)		
L-101	13965		Single	30E	2,856		105-140	1,500	6.0 h at 125 ma d-c with 100 v a-c across coil
L-102	14529		Single	38SSE	1,000		100		10.9 mh ± 5%
L-103	14527		Single	38SSE	150		11		0.205 mh ± 5%
L-104	14528		Single	38SSE	300		24		0.843 mh ± 5%
L-105	13707		Single	—	1		—		Thermistor pick-up loop; part of O-106 ARC-13826
L-106*	14140		Single	28E	13		0.03		0.25 mh
L-107*	14140		Single	28E	13		0.03		0.25 mh
L-108*	14140		Single	28E	13		0.03		0.25 mh
T-101	13791		Pri.	33	160	1-2	4.6 ± 15%	1,500	Pulse transformer
			Sec.	38	280	3-4	25.4 ± 15%		
T-102	13647		Pri.	23E	310/310	1-2	1.86-2.34	1,200	Frequency: 50 to 1,600 cps
			Sec. #1	29E	1,887	3-4	88.6-111.1	3,000	Output: 94 va
			Sec. #2	29E	1,887	4-5	102.6-128.7	3,000	Secondary current: 135 ma
T-103	13671	 1 2 115 V 3 5.0 V 4 5 6.3 V 6 7 6.3 V 8 9 5.0 V 10	Pri.	24E	413/413	1-2	2.75-3.45	1,200	Frequency: 50 to 1,600 cps
			Sec. #1	20E	19/19	3-4	0.051-0.063	2,000	
			Sec. #2	19E	24/24	5-6	0.054-0.067	1,500	Output: 70 va
			Sec. #3	13E	24	7-8	0.031-0.038	2,500	Current Sec. #1 2.0 amp Sec. #2 2.4 amp Sec. #3 5.5 amp Sec. #4 2.0 amp
			Sec. #4	20E	19/19	9-10	0.061-0.076	3,000	

* L-106, L-107, and L-108 not used in Contract N383s-5019A.

SECTION V

SUPPLEMENTARY DATA

Note

Throughout this handbook, all references to Signal Generator TS-419/U also apply to Signal Generator TS-419A/U, except where specifically noted.

1. FUNCTIONAL TUBE AND LAMP COMPLEMENT.

The types, descriptions, and functions of the electron tubes and indicator lamps for Signal Generator TS-419/U are listed in table 5-1.

TABLE 5-1. FUNCTIONAL TUBE AND LAMP COMPLEMENT FOR SIGNAL GENERATOR TS-419/U

Reference Symbol	*Type*	*Description*	*Function*
I-101	GE No. 47	Incandescent lamp	Space heater indicator
I-102			Plate and filament power indicator
V-101	7F8W†	Twin triode	Input amplifier
V-102			Rate multivibrator
V-103			Clipper
V-104			Delay multivibrator
V-105	6V6GTY	Beam tetrode	Cathode follower
V-106			Width multivibrator
V-107			Width multivibrator
V-108			Pulse amplifier
V-109			Cathode follower
V-110	7F8W†	Twin triode	Clipper
V-111	6BM6A*	Reflex klystron	R-f oscillator
V-112	5R4GY or 5R4WGA	Double diode	Rectifier
V-113			Rectifier
V-114	6V6GTY	Beam tetrode	Series losser
V-115			Series losser
V-116			Series losser
V-117	0A2 or 0A2WA	Voltage regulator	Voltage regulator
V-118			Voltage regulator
V-119			Voltage regulator
V-120			Voltage regulator
V-121	7F8W†	Twin triode	Regulator control amplifier
V-122	0A2 or 0A2WA	Voltage regulator	Voltage regulator

* Refer to Note, Section IV, paragraph 6.c.
† Type 7F8 used previously. For replacement use Type 7F8W.

2. TECHNICAL SUMMARY.

a. The following information is a technical summary of the electrical and mechanical characteristics of Signal Generator TS-419/U.

(1) FREQUENCY RANGE.—900 to 2100 mc/sec in one band; single-dial control directly calibrated to ±1 per cent.

(2) FREQUENCY STABILITY.—Warm-up drift less than 0.2 per cent; ambient drift less than 0.005 per cent per °C.

(3) POWER OUTPUT.—Zero dbm to −120 dbm continuously adjustable by a directly calibrated control accurate to ±2 dbm. Power is monitored by a temperature-compensated thermistor bridge operating a panel meter.

(4) OUTPUT IMPEDANCE.—Fifty ohms with maximum voltage standing-wave ratio (VSWR) of 2:1; BNC-type connector.

(5) TYPES OF EMISSION.—CW or pulse amplitude modulated. No provision is made for frequency modulation or for square wave modulation.

(6) SPURIOUS MODULATION.—In cw condition, FM is approximately ±0.01 per cent; AM is less than 0.5 per cent.

(7) R-F PULSE SHAPE.

(*a*) Rise time: less than 0.5 microsecond.

(*b*) Decay time: less than 0.9 microsecond.

(*c*) Flatness: within 10 per cent of amplitude of initial rise.

(8) MODULATION.

(*a*) By external pulses, positive or negative, of peak amplitude 40 to 70 volts, width 0.5 to 10 microseconds, and rate 40 to 4000 pulses per second.

(*b*) By internal pulse generator giving control of width from 0.5 to 10 microseconds, of delay from 3 to 300 microseconds (but not exceeding 75 per cent of pulse period), and of rate from 40 to 4000 pulses per second.

(*c*) By synchronization to an external pulse generator giving positive or negative pulses of amplitude 10 to 50 volts peak, width 0.5 to 20 microseconds, and rate 40 to 4000 pulses per second. Control of delay and width is as described in (*b*) above.

(*d*) By synchronization to any external sine wave generator giving amplitudes of 10 to 50 volts rms and of frequency between 40 and 4000 cycles per second. Control of delay and width is as described in (*b*) above.

(9) PULSE CONTROLS.

(*a*) PULSE WIDTH—calibrated 0.5 to 10 microseconds ±25 per cent +0.5 microsecond.

(*b*) PULSE DELAY—calibrated 3 to 300 microseconds ±25 per cent.

(*c*) PULSE RATE—calibrated 40 to 4000 pulses per second ±30 per cent.

(10) SYNC OUTPUTS.

(*a*) Undelayed, occurs within 1.5 microseconds of leading edge of sync input or of internally generated rate pulse.

Amplitude: 20 to 50 volts when working into load of greater than 500 ohms shunted by less than 1500 micromicrofarads (mmf).

Rise time: 1.2 microseconds.

Width: 1 to 4 microseconds depending on setting of pulse delay control. (This output is not available when modulating by external pulses.)

(*b*) Delayed, occurs within 1 microsecond of leading edge of r-f pulse.

Amplitude: 20 to 50 volts when working into load of greater than 500 ohms shunted by less than 1500 mmf. Rise time: less than 0.5 microsecond. Width: 1 to 3 microseconds depending on setting of PULSE WIDTH control.

(11) POWER REQUIREMENT.—115 v ± 10 per cent, 50 to 1600 cycles, single phase, 250 watts.

(12) SIZE.—17⅜ inches wide, 10½ inches high, 12 inches deep.

(13) WEIGHT.—43 pounds (less Transit Case).

(14) TUBE COMPLEMENT.—Refer to table 5-1.

3. SIGNAL GENERATOR CONSIDERATIONS.

a. It should be noted that the OUTPUT ATTENUATOR of Signal Generator TS-419 U is calibrated to indicate r-f power delivered at the front panel RF OUTPUT connector, when this connector is terminated by a 50-ohm resistive load. There is some frequency effect in the power monitoring system and this may contribute an inaccuracy up to ±1 db to the knowledge of the output power actually delivered to a resistive load. Over the range of service operating conditions and the life of the instrument, additional errors may be expected so that in general the output power actually delivered to a resistive load is known to within ±2 db. Additional errors in output power measurement may be introduced by mismatched loads or failure to take cable losses into account.

b. The internal impedance of the Signal Generator TS-419/U has been maintained sufficiently close to 50 ohms so that the VSWR, looking into the instrument through the RF OUTPUT connector, is in the worst case less than 2:1 (6 db). For a generator which is a perfect match to the transmission line, any mismatch of the load to the line will result in reduced power transferred to the load. Since the signal generator is not perfectly matched to the line, a mismatch between the load and the nominal 50-ohm resistive impedance of Signal Generator TS-419/U may cause either an increase or a decrease in power delivered to the mismatched load, as compared to that which would be delivered to a 50-ohm resistive load. The loss due to mismatched loads for a perfect signal generator and the range of loss for the maximum allowable VSWR on the actual signal generator are shown in figure 5-1.

c. Power losses in the r-f cable to the load vary with frequency and the length of the cable. These losses are small and are not important in comparative measurements, but must be taken into account for absolute measurements. The data listed in table 5-2 show the approximate attenuation in a six-foot length of RG-55 U or RG-58 U cable for the frequency range from 900 to 2100 mc sec.

TABLE 5-2. CABLE ATTENUATION

Frequency (mc/sec)	*Attenuation (db/6 ft)*
900	0.94
1000	1.00
1100	1.06
1200	1.13
1300	1.19
1400	1.24
1500	1.29
1600	1.34
1700	1.40
1800	1.45
1900	1.50
2000	1.55
2100	1.61

d. Another factor that contributes to losses is improper assembly of coaxial connectors, or deterioration of contacts within the connectors. A standing-wave ratio of several decibels, with attendant error, can often be attributed to this cause. Instructions for attaching a UG-88/U connector to RG-55/U or RG-58/U cable are given and shown in figure 7-9.

4. INTERIOR ILLUSTRATIONS.

Illustrations of the interior (figures 5-2, 5-3, 5-3A 5-3B, 5-3C and 5-3D) of Signal Generator TS-419/U (and TS-419A/U) show the physical location of those replaceable parts discussed in the test and listed in the Table of Replaceable Parts, Table 6-4.

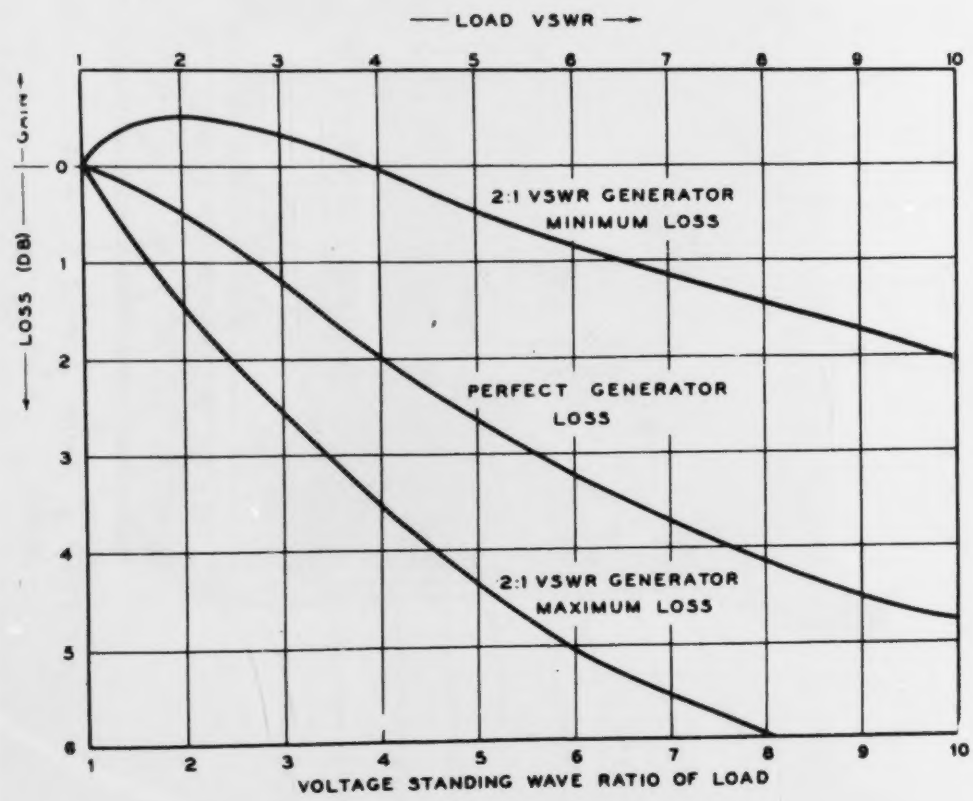


Figure 5-1. Power Loss Versus Load, Voltage Standing-wave Ratio

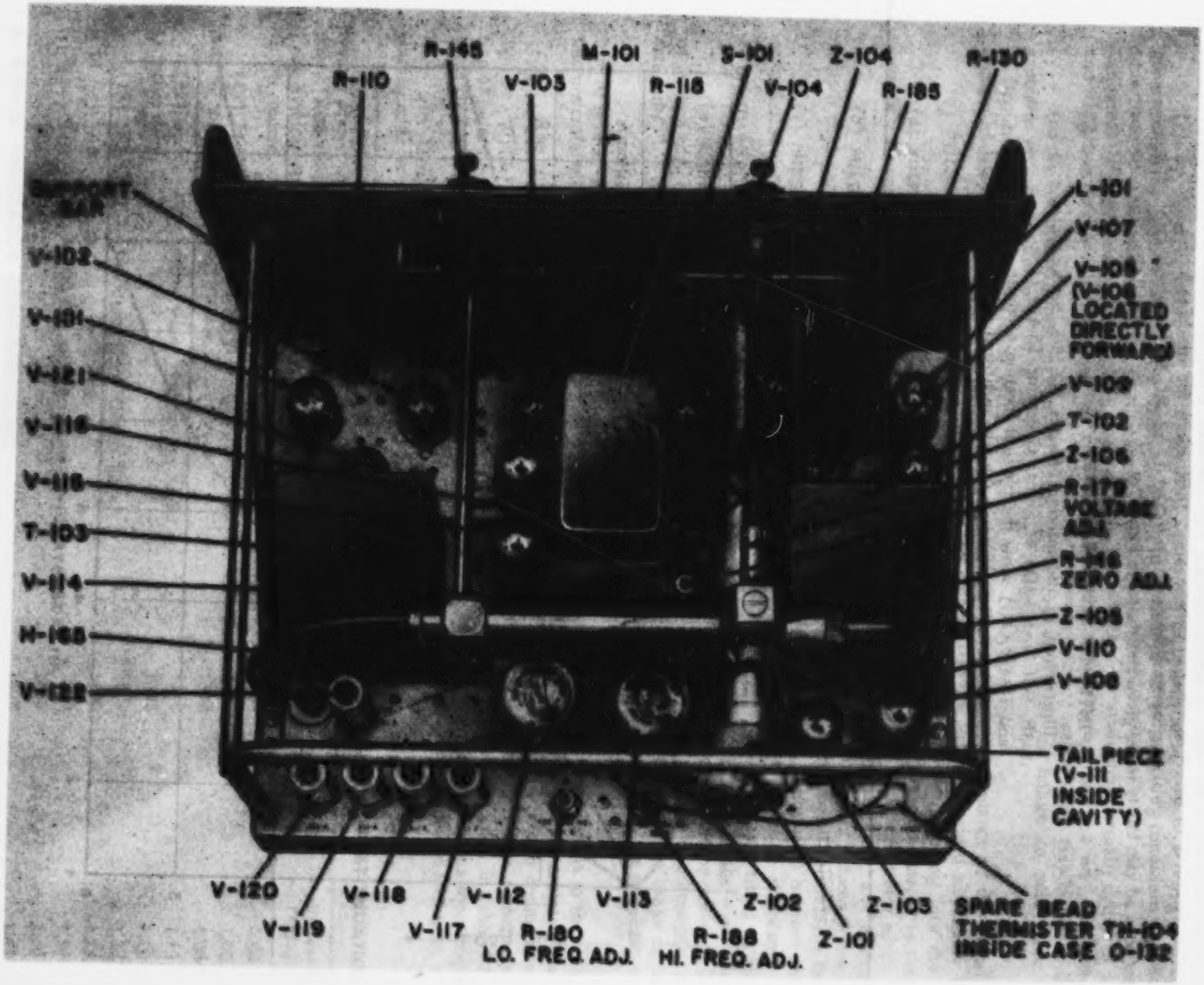

R-110
R-145
V-103
M-101
R-118
S-101
V-104
Z-104
R-185
R-130
SUPPORT BAR
V-102
V-101
V-121
V-116
V-115
T-103
V-114
H-168
V-122
L-101
V-107
V-105
(V-106 LOCATED DIRECTLY FORWARD)
V-109
T-102
Z-106
R-179 VOLTAGE ADJ.
R-146 ZERO ADJ.
Z-105
V-110
V-108
TAILPIECE (V-111 INSIDE CAVITY)
V-120
V-119
V-118
V-117
V-112
R-180 LO. FREQ. ADJ.
V-113
R-188 HI. FREQ. ADJ.
Z-102
Z-101
Z-103
SPARE BEAD THERMISTER TH-104 INSIDE CASE O-132

Figure 5-2. Signal Generator TS-419/U and TS-419A/U, Top View of Chassis

SECTION VI

TABLE OF REPLACEABLE PARTS

1. GENERAL.

a. This section contains a table of replaceable parts (table 6-4) for Signal Generator TS-419/U and TS-419A/U manufactured under the following contract numbers and applicable serial numbers:

Contract	*Serial No.*
TS-419/U	
N383s-5019A	1-201
NOa(s)-9748	1-551
NOa(s)-12279	545-898
N383s-45741	899-2036
N383s-60879	1-65
N383s-61060	1-131
N383s-67816	2037-2144
N383s-75748	1-1032
N383s-77651	1-92
TS-419A/U	
N383s-16939A	1-343
N383-31275A	344-648
N383-46093A	1-730

Note

Throughout this section of the handbook, all references to Signal Generator AN/URM-64 (including the TS-419/U component) also apply to Signal Generator AN/URM-64A (including the TS-419A/U component).

This section also includes supplementary information such as an explanation of symbols used in table 6-4, how to order spare parts, an explanation of the reference designations and abbreviations used in table 6-4, a list of manufacturers of the equipment parts, and resistor and capacitor color code charts.

b. The parts listed in table 6-4 constitute all electrical parts together with such operative mechanical parts as are subject to loss or failure, with the exception of structural and minor parts, such as standard bolts, screws, nuts, and the like. In some instances, individual detail parts of a sub-assembly may not be listed as separate items, since replacement of such items is impractical.

2. SYMBOLS USED IN TABLE 6-4, TABLE OF REPLACEABLE PARTS.

a. Where similar functional parts of the equipments manufactured under different contract numbers have characteristic differences, a symbol, consisting of an rabic numeral within a circle, is placed immediately llowing the reference designation involved; for example: C-109①. For Signal Generator TS-419A/U, the ymbol ⑫ is also used following the part number or ntractor's specification number, to indicate that this rt applies only to Contracts N383s-16939A, N383-1275A, and N383-46093A. Where identical basic reference designations are not used to identify such parts, a parenthetical cross-reference is made, within the item description, to the comparable reference designation; for example: (Refer to C-135). The symbols used and their definitions are as follows:

① This part used only in equipments manufactured under Contracts NOa(s)-9748, NOa(s)-12279, N383s-60879, and N383s-61060.

② This part used only in equipments manufactured under Contracts N383s-5019A, N383s-45741, and N383s-67816.

③ This part used only in equipments manufactured under Contracts N383s-5019A, NOa(s)-9748, NOa(s)-12279, N383s-45741, and N383s-67816.

④ This part used only in equipments manufactured under Contracts NOa(s)-9748, NOa(s)-12279, N383s-45741 (Serial No. 899 through 1385 only), N383s-60879, and N383s-61060.

⑤ This part used only in equipments manufactured under Contracts N383s-5019A, N383s-45741 (Serial No. 1386 through 2036 only), and N383s-67816.

⑥ This part used only in equipments manufactured under Contracts N383s-60879 and N383s-61060.

⑦ This part used only in equipments manufactured under Contracts NOa(s)-9748 and NOa(s)-12279.

⑧ This part used only in equipments manufactured under Contract NOa(s)-12279.

⑨ This part used only in equipments manufactured under Contracts N383s-75748 and N383-77651.

⑩ This part used only in equipments manufactured under Contract N383s-5019A.

⑪ This part not used in equipments manufactured under Contract N383s-5019A.

⑫ This part used only in TS-419A/U equipments, under Contracts N383s-16939A, N383-31275A, and N383-46093A.

b. The second column of table 6-4 lists the stock numbers used by the Air Force, Navy Bureau of Aeronautics, Navy Bureau of Ships, Marine Corps and Signal Corps. Stock numbers preceded by a four character numerical code group are Air Force stock numbers. Those preceded by the letters "N" or "G" are Navy Bureau of Ships; those preceded by "R" are Navy Bureau of Aeronautics (ASO); those whose first digit is "1", "2", or "3", followed by a letter are Marine Corps and Signal Corps. In the case of those Federal stock numbers (4-3-4 digit style) which have no prefix letters, assignment of the Federal stock number was made by the Signal Corps. All other miscellaneous types of stock numbers are either BuAer or Air Force. Not all part numbers have all stock numbers assigned.

c. An asterisk (*) inserted immediately after a BuShips stock number indicates that the part is not furnished as a maintenance part for BuShips activities personnel, and is so referenced in a footnote on the appropriate page.

d. A hatch mark (#) inserted in column 2 of table 6-4 in lieu of a stock number indicates a part not included in the spare parts groups of the Air Force or BuAer.

e. A dagger (†) inserted in column 2 of table 6-4 in lieu of a stock number indicates a part included in the equipment but neither replaceable as a separable detail part nor included in the spare parts groups of the Air Force or BuAer; they are listed for reference only. Such parts which fall into the same category for BuShips equipments are identified by a parenthetical phrase "(listed for reference only for Contracts N383s-60879 and N383s-61060)" at the end of the item description.

f. A double dagger (††) inserted in column 2 of table 6-4 indicates that this part will not be carried in stock in the electronics supply and is applicable to Contract NOa(s)-12279.

g. Where commercial parts (non-standard JAN or AN) may be replaced by a JAN or AN standard part, the JAN or AN number is inserted in Column 5 under the manufacturer and his part number, as an alternate; they are preceded by the abbreviation "Alt," even though under certain contract numbers a JAN or AN standard part was originally used by the manufacturer.

3. ORDERING OF SPARE PARTS.

a. GENERAL.—Each Service using this list has established certain depots and service groups for the storage and issue of spare parts to its organizations requiring them. The regulations of each Service should be studied to determine the method and source for requisitioning spare parts. The information in this list, as to manufacturer's or contractor's name, type, model, or drawing number, is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts directly from the manufacturer or a wholesale or retail store except under emergency conditions as covered by existing regulations of the Service concerned.

b. U. S. AIR FORCE.—This table is for information *only* and is not to be used as a basis for requisitioning parts. Authorities for obtaining maintenance items are as follows:

(1) For using organizations; applicable Service publications of the 00-30 series of USAF Technical Orders.

(2) For higher maintenance and supply echelons; the applicable Standard Maintenance List.

4. REFERENCE DESIGNATIONS.

The reference designations appearing in Column 1 of Table 6-4, Table of Replaceable Parts, correspond to those shown on the illustrations of the equipment and referenced in the text. Each reference designation consists of a hyphenated combination of one or two capital letters and three or more significant numerals (for example, C-101). The alphabetical portion of the reference designation indicates the type of apparatus or detail part classified in accordance with Table 6-1.

TABLE 6-1. STANDARD PART DESIGNATIONS

Symbol	*Type of Apparatus or Detail Part*
A	Structural parts, panels, frames, casting, etc.
C	Capacitors of all types
E	Miscellaneous electrical parts, terminal boards, insulators, knobs, etc.
F	Fuses
H	Hardware: special screws, bolts, studs, pins, etc.
I	Indicating devices (except meters and thermometers), pilot lamps, etc.
J	Jacks and receptacles (fixed connectors, male and/or female) for attachment to panel, bulkhead, etc.
L	Inductors, r-f and a-f
M	Meters of all types
N	Dials
O	Mechanical parts: bearings, shafts, couplings, gears, etc.
R	Resistors, fixed and variable, potentiometers
S	Switches
T	Transformers, r-f, i-f, and power
TH	Thermistors, thermal resistors
V	Vacuum and gaseous discharge tubes
X	Sockets for electron tubes, pilot lamps, fuses, etc.
Y	Mechanical oscillators, crystals, etc.
Z	Filters, compound tuned circuit assemblies, etc., in a common container

5. ABBREVIATIONS USED IN TABLE 6-4, TABLE OF REPLACEABLE PARTS.

The abbreviations used in Table 6-4, Table of Replaceable Parts, are listed in Table 6-2.

TABLE 6-2. ABBREVIATIONS

Abbreviation	*Definition*
AF	audio frequency
amp	ampere(s)
approx	approximate or approximately
coef	coefficient
cont	contact(s)
CT	center tap or center tapped
c to c	center to center
cps	cycles per second
csk	countersunk
ctr	center(ed)
cyc	cycles(s)
d	depth or deep
db	decibel(s)
DC	direct current

TABLE 6-2. ABBREVIATIONS (Cont.)

Abbreviation	*Definition*
deg	degree(s)
diam	diameter(s)
dimen	dimensions
ea	each
gnd	ground(ed)
h	height or high
hp	horsepower
hy	henry(s)
ID	inside diameter(s)
lg	length or long
ma	milliampere(s)
mc/s	megacycles per second
max	maximum
mf	microfarad(s)
min	minimum
mh	millihenry(s)
mmf	micromicrofarad(s)
mtd	mounted
mtg	mounting
mtg/c	mounting center(s)
mts	mounts
NC	National Coarse (thread)
neg	negative
o/a	overall
OD	outside diameter(s)
ph	phase
pl	plated
p/o	part of
rad	radius
RF	radio frequency
RMS	root mean square
rpm	revolutions per minute
sec	second(s) unit of time
secd	secondary(ies)
sect	section(s)
sq	square
SS	stainless steel
temp	temperature
term	terminal(s)
thd	thread(s)
thk	thick or thickness
tol	tolerance
v	volt(s)
vact	AC test volts
vdct	DC test volts
vdcw	DC working volts
w	watt(s)
w/	with
wd	wide or width
x	by (as used to express dimensions)
°C	degrees Centigrade
°F	degrees Fahrenheit
"	inch(es)
%	per cent
±	plus or minus

6. LIST OF MANUFACTURERS.

The manufacturers' code designation, as used in Table 6-4, and the name and address of the manufacturer are listed in Table 6-3.

TABLE 6-3. LIST OF MANUFACTURERS

Code Designation	*Name and Address of Manufacturer*
AB	Allen Bradley Co. 118 W. Greenfield Avenue Milwaukee, Wisconsin
AAEP	Augat Bros., Inc. Attleboro, Mass.
AMP	American Phenolic Corp. 1830 South 54th Avenue Chicago, Illinois
ARC	Aircraft Radio Corp. Boonton, New Jersey
ATI	Atlantic India Rubber Works, Inc. Chicago, Illinois
BIR	Birtcher Corp. 5087 Huntington Drive Los Angeles 32, California
BRY	Bryant Electric Co. Bridgeport, Conn.
BUS	Bussmann Mfg. Co. St. Louis, Mo.
CAF	Canfield Rubber Co. Bridgeport, Conn.
CEPL	Celluplastic Corp. Newark, New Jersey
CGT	Cambridge Thermionic Corp. Cambridge, Massachusetts
CLD	Cornell Dubilier Electric Corp. 1000 Hamilton Blvd. S. Plainfield, New Jersey
CN	Centralab Div. Globe-Union, Inc. Milwaukee, Wisconsin
CPH	Chicago Telephone Supply Co. Elkhart, Indiana
CUT	Cutler-Hammer, Inc. Milwaukee, Wisconsin
DLC	Dial Light Co. of America, Inc. New York, New York
EBY	Hugh H. Eby, Inc. 18 W. Chelton Ave., Philadelphia, Pennsylvania

TABLE 6-3. LIST OF MANUFACTURERS (Cont.)

Code Designation	*Name and Address of Manufacturer*
GAMA	Garde Mfg. Co. Providence, R. I.
GE	General Electric Co. Nela Park Cleveland, Ohio
GER	General Radio Co. Cambridge, Mass.
GY	Goodyear Tire and Rubber Co., Akron, Ohio
HAW	Harvey Hubbell, Inc. Bridgeport, Connecticut
JFE	Jeffers Electronics St. Marys, Pennsylvania
KK	Kurz-Kasch, Inc. Dayton, Ohio
LIT	Littlefuse, Inc. 4757 N. Ravenswood Ave. Chicago 40, Illinois
MAKY	Malco Tool and Mfg. Co. Chicago, Illinois
MAR	Marion Electrical Instrument Co. Manchester, New Hampshire
MLL	Millen, James Manufacturing Co., Inc. Malden, Massachusetts
MODE	Model Eng. & Mfg. Co. Huntington, Indiana
MUE	Mueller Electric Co. Cleveland, Ohio
NEEN	Northeastern Engineering, Inc. Manchester, New Hampshire
OAK	Oak Manufacturing Co. 1260 N. Clybourn Ave. Chicago, Illinois
PRME	Precision Metal Products Co. Stoneham, Mass.
RFLN	Roflan Co., The Everett, Massachusetts
RS	Roller-Smith Co. Bethlehem, Pennsylvania
SKY	Skydyne Corporation Port Jervis, New York
SLE	Sylvania Electric Products, Inc. Ipswich, Massachusetts
SZE	C. E. Szekely & Associates, Inc. Philadelphia, Pennsylvania
TC	Technicraft Corporation 1701 Main Building Kansas City, Missouri
TGS	George S. Thompson Co. 5240 Huntington Drive Los Angeles 32, California
TJL	J. L. Thomson Mfg. Co. Waltham, Massachusetts
TRAA	Transitron Inc. div Van Norman Industries 186 Granite Street Manchester, N. H.
UCI	The Ucinite Co. Newtonville, Massachusetts
USEA	United States Engineering Co. Glendale, California
USR	United States Rubber Co. New York, New York
VIEC	Victory Engineering Corporation Newark, New Jersey
WE	Western Electric Co. New York, New York
WS	Weston Electric Instrument Corp. Newark, New Jersey
ZE	Zierick Mfg. Corp. New Rochelle, N. Y.

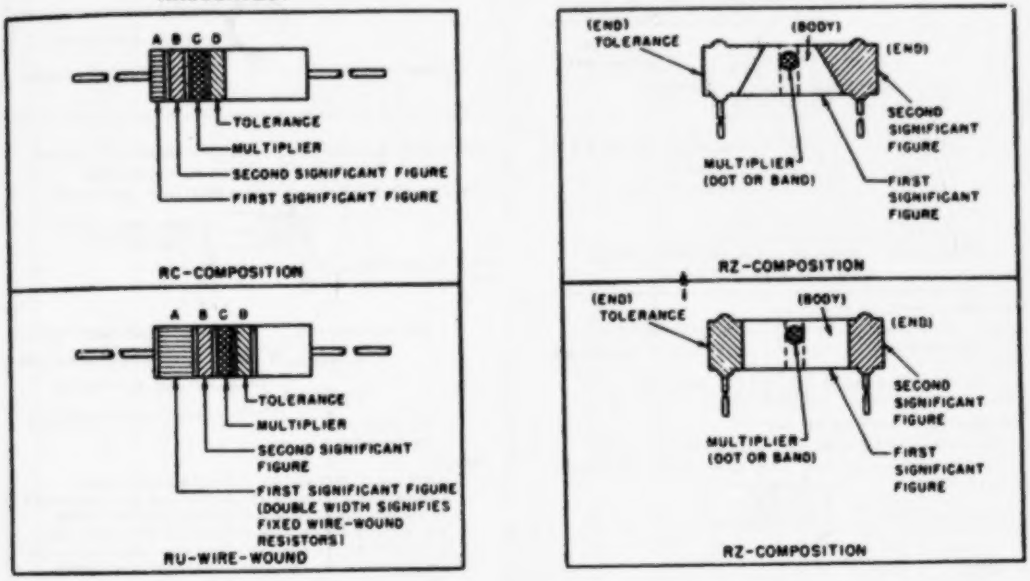
7. RESISTOR AND CAPACITOR COLOR CODES.

Resistors and capacitors which are manufactured in accordance with military standards are identified by a designation consisting of a combination of letters and numbers. This designation is known as the MIL designation and identifies the detailed part completely as to electrical and physical characteristics. On small parts such as mica capacitors and composition resistors, it is impractical to place the MIL designation on the part because of the small physical size of the part. On such parts a color code is used to identify the item as to its characteristics. Resistor color code markings are shown in figure 6-1. Capacitor color code markings are shown in figure 6-2.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS (INSULATED)

RADIAL-LEAD RESISTORS (UNINSULATED)


A B C D
TOLERANCE
MULTIPLIER
SECOND SIGNIFICANT FIGURE
FIRST SIGNIFICANT FIGURE
RC-COMPOSITION
A B C D
TOLERANCE
MULTIPLIER
SECOND SIGNIFICANT FIGURE
FIRST SIGNIFICANT FIGURE (DOUBLE WIDTH SIGNIFIES FIXED WIRE-WOUND RESISTORS)
RU-WIRE-WOUND
(END) TOLERANCE
(BODY)
(END)
SECOND SIGNIFICANT FIGURE
MULTIPLIER (DOT OR BAND)
FIRST SIGNIFICANT FIGURE
RZ-COMPOSITION
(END) TOLERANCE
(BODY)
(END)
SECOND SIGNIFICANT FIGURE
MULTIPLIER (DOT OR BAND)
FIRST SIGNIFICANT FIGURE
RZ-COMPOSITION

RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

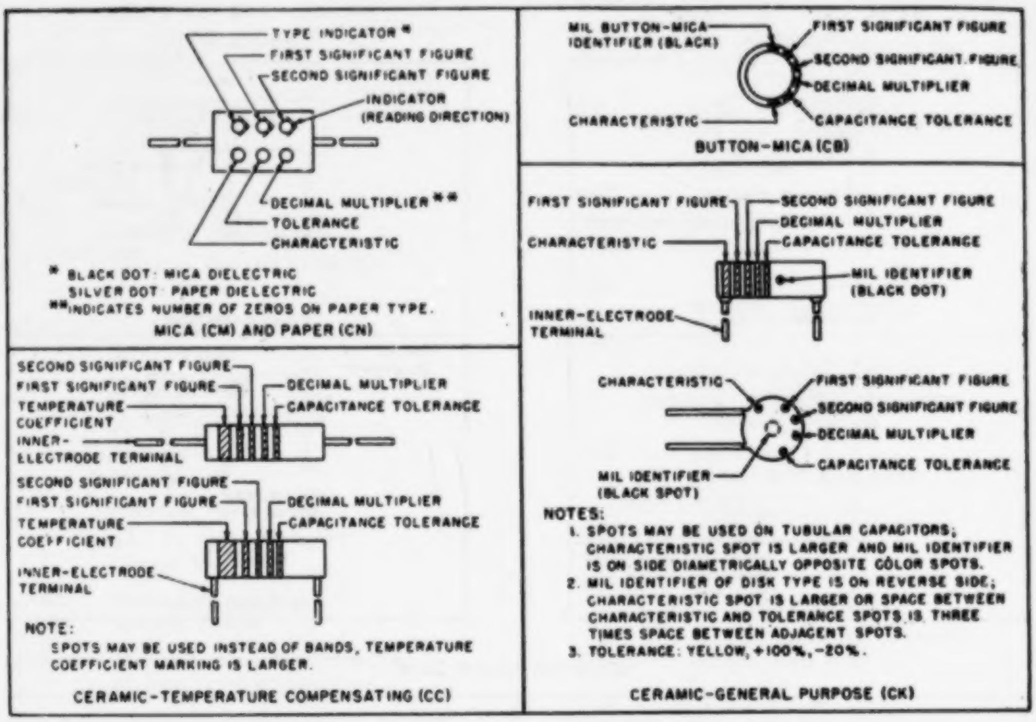
*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH. WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B; BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT: YELLOW BAND A; PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT: BROWN BODY; BLACK END; BLACK DOT OR BAND; BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT: ORANGE BODY, BLACK END, RED DOT OR BAND; SILVER END.

Figure 6-1. ***Resistor Color Codes***

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)


TYPE INDICATOR *
FIRST SIGNIFICANT FIGURE
SECOND SIGNIFICANT FIGURE
INDICATOR (READING DIRECTION)
DECIMAL MULTIPLIER **
TOLERANCE
CHARACTERISTIC
MIL BUTTON-MICA IDENTIFIER (BLACK)
FIRST SIGNIFICANT FIGURE
SECOND SIGNIFICANT FIGURE
DECIMAL MULTIPLIER
CHARACTERISTIC
CAPACITANCE TOLERANCE
FIRST SIGNIFICANT FIGURE
SECOND SIGNIFICANT FIGURE
DECIMAL MULTIPLIER
CHARACTERISTIC
CAPACITANCE TOLERANCE
MIL IDENTIFIER (BLACK DOT)
INNER-ELECTRODE TERMINAL
SECOND SIGNIFICANT FIGURE
FIRST SIGNIFICANT FIGURE
DECIMAL MULTIPLIER
TEMPERATURE COEFFICIENT
CAPACITANCE TOLERANCE
INNER-ELECTRODE TERMINAL
SECOND SIGNIFICANT FIGURE
FIRST SIGNIFICANT FIGURE
DECIMAL MULTIPLIER
TEMPERATURE COEFFICIENT
CAPACITANCE TOLERANCE
INNER-ELECTRODE TERMINAL
CHARACTERISTIC
FIRST SIGNIFICANT FIGURE
SECOND SIGNIFICANT FIGURE
DECIMAL MULTIPLIER
CAPACITANCE TOLERANCE
MIL IDENTIFIER (BLACK SPOT)

* BLACK DOT: MICA DIELECTRIC
SILVER DOT: PAPER DIELECTRIC
**INDICATES NUMBER OF ZEROS ON PAPER TYPE.

MICA (CM) AND PAPER (CN)

BUTTON-MICA (CB)

NOTE:
SPOTS MAY BE USED INSTEAD OF BANDS, TEMPERATURE COEFFICIENT MARKING IS LARGER.

CERAMIC-TEMPERATURE COMPENSATING (CC)

NOTES:
1. SPOTS MAY BE USED ON TUBULAR CAPACITORS; CHARACTERISTIC SPOT IS LARGER AND MIL IDENTIFIER IS ON SIDE DIAMETRICALLY OPPOSITE COLOR SPOTS.
2. MIL IDENTIFIER OF DISK TYPE IS ON REVERSE SIDE; CHARACTERISTIC SPOT IS LARGER OR SPACE BETWEEN CHARACTERISTIC AND TOLERANCE SPOTS IS THREE TIMES SPACE BETWEEN ADJACENT SPOTS.
3. TOLERANCE: YELLOW, +100%, -20%.

CERAMIC-GENERAL PURPOSE (CK)

CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE [2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		CC
											OVER 10UUF	10UUF OR LESS	
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2		-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500)[3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

[1] LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
[2] IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
[3] INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

Figure 6-2. Capacitor Color Codes

TABLE 6-4. TABLE OF REPLACEABLE PARTS

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number (s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
101-299 series	N16-T-20139-5951 R16AN-TS419U-SZE 3F3901.2-71	SIGNAL GENERATOR TS-419/U consists of carrying case and accessories; complete set of electron tubes; one input power cable with one male plug on one end, other end female plug; two indicator dials and two indicator lamps on front panel, all operating controls and cable receptacles on front panel; assembly enclosed in ventilated dust cover; approx 17⅜" wd x 10-7/16" h x 13-11/16" o/a	Provide signal source from 900 to 2100 mc/s for testing radio and radar equipment	TS-419/U TS-419A/U	ARC-13101 NE-949-2901 TRAA-C-0161-04001
A-101	16-O-56407-1751 7CAC-075609-5 Shop manufacture††, 2Z7090.245	PLATE, cavity assembly: consists of 525½H aluminum alloy plate 9⅞" lg x 5¾" wd x 0.125" thk; on which are mtd three 17S-A aluminum alloy posts 0.640" lg x 0.312" diam for 0.484" lg and 0.156" diam for 0.156" lg, larger diam threaded w/#6-32 NC-2 for ¼" d; two half-hard brass nickel pl bearings; and six 17S-T aluminum alloy posts 0.764" lg x 0.312" diam for 0.609" lg and 0.156" diam for 0.156" lg larger diam threaded w/#6-32 NC-2 for ⅜" d	Front plate, cavity assembly	ARC-13662 SZE-354-C-6206 TC-763A0001 MODE-A-5073 TRAA-A-0161-04101	16G5(Aer) SZE-354-C-6206 TC-763A0001 MODE-A-5073 ~~TRAA-A-0161-~~ 04101
A-102◎●	R16NEEN-NE949-2898	COVER ASSEMBLY, dust: c/o gray crackle finish alum cover, louvred on sides and back; with eight rubber bumpers, approx 17⅜" lg x 11¾" wd x 10⅞" h	Protects chassis component parts	NEEN-949-2898 TRAA-D-0161-04009	NEEN-949-2898 TRAA-D-0161-04009
A-103◎		FRONT PANEL ASSEMBLY: c/o alum engraved panel, with window, approx 17" lg x 10½" thk	Mounting for controls, dials and jacks	NEEN-949-9338	NEEN-949-9338
A-104◎●		CHASSIS ASSEMBLY: c/o alum chassis, stiffeners, switch tray assy and thermistor mount; approx 15⅞" lg x 11-11/-16" wd x 5⅝" h	Mounting for component parts	NEEN-949-9390 TRAA-D-0161-04018	NEEN-949-9390 TRAA-D-0161-04009
A-105	R16-G-3240 For reference only†† 6625-697-1105	CAVITY ASSEMBLY: 900 to 2100 mc; complete assembly less klystron tube; includes attenuator complete w/dial mechanism and frequency dial mechanism w/tracking voltage control (listed for reference only for Contracts N383s-60879 and N383s-61060)	R-f generator	ARC-13829 TC-761E0032 SZE-354-R-6196 MODE-D-7057A TRAA-D-0161-04100	ARC-13829 TC-761E0032 SZE-354-R-6196 MODE-D-7057A TRAA-D-0161-04009
A-106	3300-328557908 R16-C-16300-925 N6625-604-0737 7CAC-177625 7CAC-177626 R16MODE-B7046	SUB-ASSEMBLY: cavity, tuned; frequency range 900-2100 mc; p/o cavity assembly A-105; consists of cylindrical cavity, tube socket, cylindrical conductors, worm-driven adjustable contacting ring assembly for tuning and high-frequency iron-cored choke w/through term; manual tuning; approx 12" lg x 3⅝" wd x 6⅜" h o/a; mtd by two #6-32 tapped inserts on 1½ mtg/c on mtg bracket and three #6-32 tapped holes in end bearing	R-f generator	ARC-13778 SZE-354-C-6253 TC-762D0001 MODF-B-7046 TRAA-D-0161-04249	ARC-13778 SZE-354-C-6253 TC-762D0001 MODE-B-7046 TRAA-D-0161-04249

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
A-107	3300-287654841 R16-A-5912 N16-A-98986-1892	SUB-ASSEMBLY: attenuator; p/o cavity assembly A-105; consists of waveguide with accessory parts forming attenuator sub-assembly and two disc thermistors; RF capacitors and chokes constructed as integral parts of the item; shaft-operated means of adjusting attenuation of RF power transmitted from cavity oscillator to RF output of Signal Generator TS-419/U; ext surfaces brass, silver pl; provides continuously variable RF output attenuation over range —3 to —120 db in frequency band 900 to 2100 mc; approx 8" lg x 3⅜" wd x 4" h o/a; mtd on cavity by means of one captive ⅞"-27 NS-1 straight knurled nut, mtd to chassis by post and to frontplate by post	Output coupling for Signal Generator TS-419/U	ARC-13814 TC-767D0001 SZE-354-C-6254	ARC-13814 TC-767D0001 SZE-354-C-6254
A-107ⓢⒻ	7CAC-075609-23 2Z3270-40 N6625-604-0734	ATTENUATOR SUB-ASSEMBLY: same as A-107 except includes thermistor, thermistor coupling assy and thermistor r-f choke assy. Approx 10" lg o/a	Output coupling for Signal Generator TS-419/U	MODE-C-7059C TRAA-D-0161-04194	MODE-C-7059C TRAA-D-0161-04194
A-108	16-C-170001-451	BUMPER, rubber: 1" diam x 13/32" h; ⅜" x 3/16" d ctr depression w/0.125" mtg hole	For cabinet	GY No. 4½	ARC-11177 SZE-354-A-6007
A-109ⓢⒻ		FRAME: U-shaped alum rod 7/16" diam; 5-9/16" lg x 7-9/16" wd; each end tapped 10-32	Protects components	NEEN-949-3409 TRAA-A-0161-04331	NEEN-949-3409 TRAA-A-0161-04331
A-110ⓢ	R16NEEN-NE949-2895	BOX ASSEMBLY, spare parts: p/o A-108; consists of cover, and hdw; approx 10⅛" lg x 7¼" wd x 1⅞" h	Hold spare parts	NEEN-949-2895	NEEN-949-2895
A-111ⓢⒻ		BRACE: alum tubing ⅜" diam; approx 11⅜" lg o/a 2 required	Support front panel	NEEN-949-3410 TRAA-A-0161-04329	NEEN-949-3410 TRAA-A-0161-04329
A-112ⓢⒻ		BRACE: alum rod; ⅜" diam x 10-15/16" lg ends drilled and tapped 10-32 NC-2. 2 required	Support front panel	NEEN-949-3412 TRAA-A-0161-04330	NEEN-949-3412 TRAA-A-0161-04330
A-113ⓢⒻ	R16MODE-B5176C 6625-523-7783	ATTENUATOR SUB-ASSEMBLY: p/o A-107; consists of waveguide w/o accessory parts; includes brass tube, brass attenuator block, brass support and beryllium copper spring; whole assembly silver pl; approx 8¼" lg x 2½" wd x 3⅜" h o/a	Part of A-107	MODE-B-5176C TRAA-C-0161-04195	MODE-B-5176C TRAA-C-0161-04195
A-114ⓢ	7CM3-ME-B-7041 3F47700	CAVITY DRIVE ASSEMBLY: p/o A-105; consists of contacting ring assembly, E-101; repeller conductor assembly E-102; insulator E-115; bearing race assembly H-157; worm and nut assembly O-101; three rods O-103; bearing O-104; plate O-129; three rods O-133; shell assembly Y-101; race and ball bearing assembly; approx 8½" lg and 1½" diam o/a	Cavity drive mechanism	MODE-B-7041	MODE-B-7041

A-115Ⓜ	6625-565-0221	SUB-ASSEMBLY: cavity, tuned; p/o cavity assembly A-106; consists of inner cavity, repeller cylinder assembly, 3 guide rods, frequency adjustment nut assembly, frequency drive worm, retaining ring, 3 push rods, and contacting ring assembly; approx 9" lg x 1½" dia o/a		TRAA-C-0161-04242	TRAA-C-0161-04242
C-101	3300-317680857 R16-C-8415-500 N16-C-19111-1125	CAPACITOR, fixed: ceramic dielectric: 10,000 mmf min; temp range −40° C to +65° C; 500 vdcw; 1-7/64" lg x 13/64" diam; two radial wire leads, uninsulated; use C-101 Ⓜ for replacement	Blocking, sync input J101	CNTypeBC35	ARC-8283 SZE-354-A-2001 TC270A0001
C101Ⓡ Ⓔ	3330-055475383 R16-C-19134-6150N 43DA10-428 N5910-666-8906	CAPACITOR, fixed: ceramic dielectric; 10,000 mmf min temp range −40° C to +65° C; two radial wire leads, uninsulated; 1-3/16" lg x 5/16" diam	Blocking, sync input J101	CND6-103	NEEN-12416
C-101Ⓜ		CAPACITOR, fixed: mica dielectric; 10,000 mmf ±10%; 500 vdcw; 53/64" sq x 11/32" thk, excluding term; two uninsulated axial term ea 1⅛" lg x 0.040" diam	Blocking, sync input J101	CLD 1DLS5S1	ARC-8602
C102		Not used			
C-103		CAPACITOR, fixed: same as C-101; use C-103Ⓜ for replacement	Coupling, grid V-101B		
C-103Ⓜ		CAPACITOR, fixed: same as C-101Ⓜ			
C-103Ⓔ		CAPACITOR, fixed: same as C-101ⓇⒺ			
C-104	3300-314874000 R16-C-10079-50 N16-C-31085-3992	CAPACITOR, fixed: mica dielectric; 1,000 mmf ±5%; 300 vdcw; 11/16" lg x 13/64" thk, excluding term; two uninsulated axial term ea 1½" lg x 0.040" diam	Differentiator, input amplifier plate output	CLD Type 5	ARC-4157 SZE-354-A-2000
C-104Ⓡ	3330-314874000 N16-C-31085-3723 For replacement use SNSN N16-C-31085-2032††	CAPACITOR, fixed: mica dielectric; 1,000 mmf ±5%; 500 vdcw; 53/64" max lg x 11/32" max thk, excluding term; two input insulated axial term ea 1⅛" min lg x 0.040" max diam	Differentiator, input amplifier plate output	CM-35A101J	JAN-C-5
C-104Ⓡ Ⓔ	3330-055950281 3K201022 N5910-636-2134	CAPACITOR, fixed: mica dielectric 1,000 mmf ±5%; 300 vdcw; two uninsulated axial terminals, 51/64" lg x 15/32" wd x 7/32" thk	Differentiator, input amplifier plate output	CM20B102J	MIL-C-5
C-105	3300-376144290 R16-C-10492-56 3K3510332 N5910-184-5995	CAPACITOR, fixed: silver mica dielectric; 10,000 mmf ±5%; 400 vdcw; 25/32" lg x 25/32" wd x 9/32" thk	Feedback, plate V-102B to grid V-102A	CM35C103J	MIL-C-5
C-106	3300-376022400 R16-C-9994-30-100 For replacement use N5910-161-4500 3K2030122	CAPACITOR, fixed: mica dielectric; 300 mmf ±5%; 500 vdcw; 11/16" lg x 7/16" wd x 3/16" thk less term; two axial term 1½" lg ea, uninsulated	Feedback, plate V-102B to grid V-102A	CM20A301J CM20D301JⓂ	JAN-C-5 MIL-C-5AⓂ

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-107	3300-313330340 R-16-C-7870-98 N5910-101-5114 3D9030-41	CAPACITOR, fixed: ceramic dielectric; 30 mmf ±2%; 500 vdcw; temp coef −0.00003 mmf/mmf/°C ±0.00006 mmf/mmf/°C; 5/32" diam 7/16" lg	Differentiator, plate output V-102A	CC30HH300G	JAN-C-20A
C-108		CAPACITOR, fixed: same as C-106	Plate-grid coupling, V-102A to V-102B		
C-109[illegible] [illegible] [illegible]	3300-314074221 R16-C-8352-810 N5910-195-6671 3D9180-25	CAPACITOR, fixed: ceramic dielectric; 180 mmf ±2%; 500 vdcw; temp coef −0.00003 mmf/mmf/°C ±0.00003 mmf/mmf/°C; 5/32" diam x 1¼" lg; used in serial No. 1-551	Plate-grid coupling, V-104A to V-104B	CC35HG181G	JAN-C-20A
C-109[illegible]	R16C9972-100	CAPACITOR, fixed: ceramic dielectric; 240 mmf ±3%; 500 vdcw; temp coef −0.00003 mmf/mmf/°C; 17/64" diam x 1¾" lg	Plate-grid coupling, V-104A to V-104B	CN Class A Alternate CC45HG241G	ARC-8105 JAN-C-20A
C-110[illegible] [illegible] [illegible]		CAPACITOR, fixed: same as C-107	Grid input differentiator, V-105		
C-110[illegible]	3300-313584300 R16C8271-22	CAPACITOR, fixed: ceramic dielectric; 50 mmf ±2%; 500 vdcw; temp coef −0.00003 mmf/mmf/°C ±0.00003 mmf/mmf/°C; 5/32" diam x 11/16" lg	Grid input differentiator, V-105	CN TC25 Alt CC32HG510G	ARC-8241 JAN-C-20A
C-111[illegible]	3300-316163466 R16-C-11292-140 N16-C-54396-9400	CAPACITOR, fixed: paper dielectric; non-inductive; 3-sect; each sect 50,000 mmf ±15%; 400 vdcw; hermetically sealed metal case; 1-3/16" diam x 1" h; mineral-oil-impregnated and wax filled; 4 stud term located on top; one side of each of 2 sect internally grounded, both sides of other sect insulated; 2 mtg inserts 0.172" lg x 0.219" diam, tapped #3-48 x 7/64 in. d on ⅝" mtg/c on bottom of can (refer to C-135 and C-136)	(Refer to C-111A, -B, -C)	ARC-11912	ARC-11912 TC-216B0002
C-111A [illegible]	For reference only††	CAPACITOR, fixed: p/o C-111; one sect, 50,000 mmf ±15% (refer to C-135)	Output blocking, V-109		
C-111B [illegible]		CAPACITOR, fixed: same as C-111A (refer to C-136)	Screen grid bypass, V-107		
C-111C [illegible]		CAPACITOR, fixed: same as C-111A (refer to C-136)	Screen grid bypass, V-107		

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-111③ ❸	R16MIL-CP67B1EF503K N5910-196-2496 5910-196-2496	CAPACITOR, fixed: paper dielectric, non-inductive; 1 sect; 50,000 mmf ±10%; 600 vdcw, hermetically sealed metal case; 1¾" lg x 41/64" wd x 1-1/16" h; 2 solder lug term located on top; 2 mtg holes 2⅛" C to C	Output blocking, V-109	CP67B1EF503K	MIL-C-25
C-112① ② ❸		CAPACITOR, fixed: same as C-107	Differentiator, plate output, V-104B		
C-112③	3300-314146644 R16C8356	CAPACITOR, fixed: ceramic dielectric; 200 mmf ±5% at 1 mc; 500 vdcw; temp coef −0.00075 (±0.00012) mmf/mmf/°C; 5/32" diam x 27/32" lg; radial wire leads	Coupling, V-103B to V-106	CN Class C Alt CC32UJ201J	ARC-4513 JAN-C-20A
C-113① ② ❸		CAPACITOR, fixed: same as C-107	Plate-grid coupling, V-106 to V-107		
C-113③		CAPACITOR, fixed: same as C-110③	Plate-grid coupling, V-106 to V-107		
C-114		CAPACITOR, fixed: same as C-101; use C-114❷ for replacement	Plate-grid coupling, V-106 to V-107		
C-114❷		CAPACITOR, fixed: same as C-101❷			
C-114❸		CAPACITOR, fixed: same as C-101②❸	Plate-grid coupling, V-106 to V-107		
C-115		CAPACITOR, fixed: same as C-101; use C-115❷ for replacement	Input coupling, V-108		
C-115❷		CAPACITOR, fixed: same as C-101❷			
C-115❸		CAPACITOR, fixed: same as C-101②❸			

C-116		CAPACITOR, fixed: same as C-107	Differentiator, grid input V-109		
C-117③		CAPACITOR, fixed: same as C-111 (refer to C-137 and C-138)	(Refer to C-117A, -B, -C)		
C-117A ③		CAPACITOR, fixed: p/o C-117; same as C-111A (refer to C-137)	Blocking, output V-105		
C-117B ③		CAPACITOR, fixed: p/o C-117; same as C-111A (refer to C-138)	Grid bias filter, V-106 and V-108		
C-117C ③		CAPACITOR, fixed: p/o C-117; same as C-111A (refer to C-138)	Grid bias filter, V-106		
C-117⑧ ⓫	R16C44257-1102N N5910-112-7319 5910-192-9724	CAPACITOR, fixed: paper dielectric; 50,000 mmf ±10%; 600 vdcw; hermetically sealed metal can; 1-5/16" lg x 49/64" wd x 1-1/16" h; oil impregnated, 2 solder lug terminals on bottom, mtd by CP06SA1 bracket	Blocking, output, V-105	CP61B1EF503K	MIL-C-25
C-118①	3300-319001024 R16-C-11710-11 N16-C-47321-9345	CAPACITOR, fixed; paper dielectric; 500,000 mmf +20%, —10%; 300 vdcw; hermetically sealed metal can; 1¾" lg x ⅞" wd x ¾" h approx; mineral-oil-impregnated; 2 stud term located on top; no internal ground connections; 2 mtg ears w/2.149" diam mtg holes on 2⅛" mtg/c	Klystron grid bias filter, V-111	ARC-1573 Alternate CP53B1EF504V	ARC-1573 JAN-C-25
C-118②		CAPACITOR, fixed: paper dielectric; 500,000 mmf +20%; —10%; 600 vdcw; hermetically sealed metal can; 2½" lg x 1" wd x 1⅜" h o/a; mineral-oil-impregnated; 2 solder lug term located on top; 2 mtg ears with 3/16 in. diam holes on 2⅛" mtg/c	Klystron grid bias filter, V-111	CP54B1EF504V	JAN-C-25
C-118⑧ ⑨ ⓫	16-C-47321-9345 For replacement use SNSN N5910-112-7407	CAPACITOR, fixed: paper dielectric; 500,000 mmf +20%, —10%; 400 vdcw; hermetically sealed metal can; approx 1¾" lg x ⅞" wd x ¾" h; mineral-oil-impregnated; 2 solder lug term located on top; no internal ground connections; 2 mtg ears w/two 3/16" diam mtg holes on 2⅛" mtg/c	Klystron grid bias filter, V-111	CP53B1EF504V CP53B1EF504V⓫	JAN-C-25 MIL-C-25⓫
C-119	3300-317760049 R16-C-11333-121 N5910-129-1396 3DA100-824	CAPACITOR, fixed: paper oil-filled dielectric; two sect, ea 100,000 mmf +20%, —10%; 1,000 vdcw; 2.437" lg x 1" wd x 0.750" thk, less term, three term used	Reflector filter, V-111	CP53B4FG104V	JAN-C-25
C-119A	For reference only††	CAPACITOR, fixed: p/o C-119; 100,000 mmf +20%, —10%	Reflector filter, V-111		
C-119B	For reference only††	CAPACITOR, fixed: p/o C-119; same as C-119A	Reflector filter, V-111		
C-120	3300-317643037 R16JAN- CP70E1FG405X N16-C-49997-8782 3DB4-398	CAPACITOR, fixed: paper oil-filled dielectric; 4 mf +40%, —15%; 1,000 vdcw; 5½" h x 2½" wd x 1-3/16" thk; 2 term	Main power supply filter	CP70E1FG405X	JAN-C-25
C-120⓫	N5910-120-1671	CAPACITOR, fixed: same as C-120 except ± 10% tolerance		CP70E1FG405K	MIL-C-25
C-121		CAPACITOR, fixed: same as C-120	Reflector supply filter, V-111		
C-121⓫		CAPACITOR, fixed: same as C-120⓫			

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-122②	3300-317643036 R16-C-9651-25 N16-C-19443-6420	CAPACITOR, fixed, electrolytic; 4 mf; 450 vdcw; operating temp range −40°C to +65°C; approx 1" h x 1" diam; hermetically sealed can; 2 stud term located on top, mica insulation; both term insulated internally from can, negative term externally grounded to can; 2 mtg inserts on bottom, tapped #3-48 x 7/64" d on ⅝" mtg/c	Regulated supply output filter	ARC-12586	ARC-12586 TC-217B0002
C-122⑨⑬	R16JAN-CE64E040R N5910-114-3473	CAPACITOR, fixed: electrolytic; 4 mf; 450 vdcw; 15/16" h x 2½" wd x 1" d less term; two solder lug terminals, top	Regulated supply output filter	CE64E040R	JAN-C-62
C-122⑧	3300-055725219 R16C19443-6320N 3DB4-294	CAPACITOR, fixed, electrolytic; 4 mf; 450 vdcw; operating temp range −40°C to 65°C; hermetically sealed can; 2 stud term located on top; mica insulation; both term insulated internally from can; 2 mtg inserts on bottom tapped #3-48 x 7/64" on ⅝" mtg/c. Approx 1-11/32" lg x 1-3/16" diam	Regulated supply output filter	CLD Part No. FAC1004	NEEN-12418
C-123①		CAPACITOR, fixed: same as C-118①	Decoupling, V-101A		
C-123②		CAPACITOR, fixed: same as C-118②	Decoupling, V-101A		
C-123⑨⑬		CAPACITOR, fixed: same as C-118⑨⑬	Decoupling, V-101A		
C-124①		CAPACITOR, fixed: same as C-118①	Decoupling, V-101B		
C-124②		CAPACITOR, fixed: same as C-118②	Decoupling, V-101B		
C-124⑨		CAPACITOR, fixed: same as C-118⑨	Decoupling, V-101B		
C-124⑬	N5910-112-7121	CAPACITOR, fixed: paper dielectric; 500,000 mmf ±10%, 400 vdcw; hermetically sealed metal case	Decoupling, V-101B	CP54B1EE504K	MIL-C-25
C-125		Not used			
C-126	3300-313936482 R16-C-8345-35 N5910-191-9832 3D9120-22	CAPACITOR, fixed: ceramic dielectric; 120 mmf ±2.5% at 1 mc; neg temp coef 0.000075 (tol ±0.00012) mmf/mmf/°C; 500 vdcw; 7/16" lg x 5/32" diam; radial wire leads uninsulated	Plate-grid feedback V-107 to V-106	CN Class D Alt- CC30UJ121G	ARC-8013 JAN-C-20A
C-127	3300-314146630 R16-C-8356-45 N5910-112-8381 3D9200-96	CAPACITOR, fixed: same as C-112②	Plate loading, V-101A	CN Class C Alt- CC32UJ201J	ARC-4513 JAN-C-20A
C-128		CAPACITOR, fixed: same as C-101; use C-128⑬ for replacement	Blocking, ext mod input J-104		
C-128⑬		CAPACITOR, fixed: same as C-101⑨⑬			
C-128⑧		CAPACITOR, fixed: same as C-101⑧			
C-129		CAPACITOR, variable: air dielectric; special; structural part of cavity	Coupling, r-f output	(none)	(none)

C-130		CAPACITOR ASSEMBLY: special; structural part of cavity; c/o C-130A and C-130B or E-105; (listed for reference only)			
C-130A	3300-293539868 R6625-608-6254-E-212 N16-F-650431-101	PLATE, capacitor: mica dielectric; special; structural part of cavity; spring temper, brass nickel pl; flat round plate 0.555" diam x 0.032" thk pierced by three parallel slots 0.375" lg x 0.016" wd, middle slot passing across 0.028" diam drilled and 90 deg csk hold both sides to 0.040" diam in ctr of disc (For Contract NOa(s)-12279, refer to A-109⑧)	Thermistor r-f return	ARC-13182 SZE-354-A-6256 TRAA-A-0161-04162	ARC-13182 SZE-354-A-6256 TRAA-A-0161-04162
C-130B	3300-656434655 R16-W-917 N17-I-77173-1745	WASHER, flat: clear India ruby mica; round; 0.196" ID x 0.625" OD x 0.003" thk (refer to E-105)	Insulator, thermistor by-pass capacitor	ARC-13482 SZE-354-A-6235 TC-761A0057	ARC-13482 SZE-354-A-6235 TC-761A0057
C-130⑧	3350-752000-1511 R16MODE-A7008B 2Z7098-49	CAPACITOR, disk: mica dielectric; special p/o cavity A-106; slotted circular stainless steel disk, 0.554" diam x 0.032" thk, w/three parallel slots, outer two 0.018" wd and 0.375" lg and center 0.012" wd and 0.373" lg; 0.028" diam hole in ctr	Thermistor r-f return	MODE-A-7008B	MODE-A-7008B
C-131④		CAPACITOR, fixed: same as C-101; use C-131⑤ for replacement	Coupling, grid V-121B		
C-131⑤		CAPACITOR, fixed: same as C-101⑩			
C-131⑨⓬		CAPACITOR, fixed: same as C-101⑨⓬	Coupling, grid V-121B		
C-132②		CAPACITOR, fixed: same as C-110②	Differentiator plate output, V-104B		
C-132⑨ ⓬	3DA100-979 N5910-112-6813	CAPACITOR, fixed: paper dielectric; 100,000 mmf ±10%; 600 vdcw, herm. sealed can; 1-5/16" lg x 49/64" wd x 1⅜" h; oil impregnated; 2 solder lug term. on bottom; no internal gnd.; mtg by CP065A2 bracket	Screen grid by-pass, V-107	CP61B1EF104K	MIL-C-25
C-133⑨	3300-056750378 R16C53002-4342N 3DA50-558	CAPACITOR, fixed: paper dielectric; 2 sect 50,000 mmf ea sect. ±15%; 600 vdcw; hermetically sealed metal can; 2½" lg x 1" wd x ¾" h; oil impregnated; 3 solder lug term on bottom; no internal gnd; two mtg ears 2⅛" C to C		CP55B4EF503L	JAN-C-25
C-133⓬	N5910-112-7300 5910-247-1432	CAPACITOR, fixed: same as C-133⑨ except +20% −10% tolerance		CP55B4EF503V	MIL-C-25
C-133A⑨		CAPACITOR, fixed: part of C-133⑨ one sect. 50,000 mmf ±15%	Grid bias filter, V-106 and V-108		
C-133A⓬		CAPACITOR, fixed: part of C-133⓬ one sect. 50,000 mmf	Grid bias filter, V-106		
C-133B⑨		CAPACITOR, fixed: part of C-133⑨; same as C-133A	Grid bias filter, V-106		
C-133B⓬		CAPACITOR, fixed: part of C-133⓬; same as C-133A⓬	Grid bias filter, V-108		
C-134		Not used			
C-135⑧ ⑧	R16JAN- CP61B1DF503K N16-C-44257-1094	CAPACITOR, fixed: paper dielectric; 50,000 mmf ±10%; 600 vdcw; hermetically sealed non-magnetic case; oil impregnated; 1-1/16" h x 1-5/16" w x 49/64" thk, less terminals; two solder lug term (refer to C-111A)	Output blocking V-109	CP61B1DF503K	JAN-C-25

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
C-136⊙ ⊙	R16JAN-CP63B2DE104K N16-C-45773-7488	CAPACITOR, fixed: paper dielectric; 100,000 mmf ±10%; 400 vdcw, hermetically sealed, non-magnetic case; oil impregnated; 2-5/16" w x 1-1/16" h x 49/64" thk, less term; two .156 slots on 1-15/16" ctrs for mtg; two solder lug terminals, top (refer to C-111B and C-111C)	Screen bypass V-107	CP63B2DE104K	JAN-C-25
C-137⊙ ⊙	R16JAN-CP67B1FF503K N16-C-44257-2960	CAPACITOR, fixed: paper dielectric; 50,000 mmf ±10%; 600 vdcw; hermetically sealed, non-magnetic case; oil impregnated; 2-7/16" w x 1-1/16" h x 41/64" thk, less term; two .156 slots on 2⅛" ctrs for mtg; two solder lug terminals, top (refer to C-117A)	Blocking output V-105	CP67B1FF503K	JAN-C-25
C-138⊙ ⊙	R16JAN-CP69B4FF503K N16-C-53010-6064	CAPACITOR, fixed: paper dielectric; two section, 50,000 mmf ±10% ea section; 600 vdcw; hermetically sealed, non-magnetic case; oil impregnated; 2-7/16" w x 1-1/16" h x 41/64" thk, less term; two 0.156" slots on 2⅛" ctrs for mtg; three solder lug terminals, bottom (refer to C-117B and C-117C)	(Refer to C-138A, -B)	CP69B4FF503K	JAN-C-25
C-138A⊙		CAPACITOR, fixed: p/o C-138; 50,000 mmf ±10% (refer to C-117B)	Grid bias filter V-106 & V-108		
C-138B⊙		CAPACITOR, fixed: p/o C-138; same as C-138A (refer to C-117C)	Grid bias filter V-106		
E-101	3300-287390383 R16-B-11951 N17-C-77565-7023 Shop manufacture†† R16MODE-A7020 2Z3193-77	RING, contacting: p/o cavity sub-assembly A-106; c/o beryllium copper contacting ring, riveted to bakelite ring; approx 1-33/64" diam x ⅞" lg; three mtg holes parallel to axis of ring, spaced 120 deg apart on 1.218" diam circle, tapped #6-32 NC-2	Contact between cavity shell and cylindrical conductor assembly	ARC-13777 SZE-354-A-6255 TC-763A0083 MODE-A-7020 TRAA-A-0161-04318	ARC-13777 SZE-354-A-6255 TC-763A0083 MODE-A-7020 TRAA-A-0161-04318
E-101A	R6625-608-8970-E222	RING, contacting: part of E-101		TRAA-B-0161-04319	TRAA-B-0161-04319
E-101B		INSULATOR: part of E-101		TRAA-A-0161-04320	TRAA-A-0161-04320
E-102	3300-299550406 R16-L-4883-550 N16-O-66125-8117 Shop manufacture†† R16MODE-A7016 2Z10008-125	SUB-ASSEMBLY: reflector contact ring and conductor; p/o cavity sub-assembly A-106, c/o tubular conductor, two ceramic washers, contacting ring, and cap; the cap drilled to receive banana plug type connector on choke; approp 2⅞" lg x 27/32" diam o/a	Conductor between electron tube cap and choke, along axis of cavity	ARC-13757 SZE-354-A-6257 TC-762A0041 MODE-A-7016 TRAA-A-0161-04288	ARC-13757 SZE-354-A-6257 TC-762A0041 MODE-A-7016 TRAA-A-0161-04288
E-102A	†	Part of E-102			

E-102B	†	Part of E-102			
E-103	†	RING, contacting: outer ring klystron contact; c/o cavity sub-assembly A-106; beryllium copper ring, 1.530" OD x 0.969" ID; OD bent up to from 0.187" h lip, ID lip separated w/24 slots, 15 deg apart x 0.015" w; OD lip separated w/24 slots, 15 deg apart x 0.015" wd	Contacting outer ring of V-111	ARC-14127 MODE-B-7043D TRAA-B-0161-04284	ARC-14127 SZE-354-B-6340 MODE-B-7043D TRAA-B-0161-04284
E-104	†	SLEEVE: attenuator; p/o attenuator sub-assembly A-107, half-hard brass; 1.819" lg x 0.750" diam max o/a; turned to 0.490" diam for 1.381" lg followed by shoulder 0.750" diam x 0.094" h, remainder turned to 0.498 in. diam, drilled w/0.375" diam hole starting from longer end 1.719" d; drilled w/0.344" diam hole for 0.100" from shorter end	Outer conductor of resonant pickup line	ARC-13495 TRAA-A-0161-04218	ARC-13495 SZE-354A-6372 TRAA-A-0161-04218
E-105	17-I-77173-1745	See C-130B			
E-105Ⓢ Ⓢ	6L52503	WASHER, flat: clear India ruby mica; round 0.120" ID x 0.625" OD x 0.003" thk (See C-130B)	Insulator, thermistor by-pass capacitor	MODE-A-9026 TRAA-A-0161-04146	MODE-A-9026 TRAA-A-0161-04146
E-106	3300-331088751 R16-I-9200-500 N17-I-48996-8901*	INSULATOR, bushing: tubular, natural bakelite tubing 0.187" lg; 0.625" OD x 0.562" ID; p/o cavity, A-105	Bakelite, ring, thermistor mount	ARC-13475 SZE-354-A-6258 TC-761A0038 TRAA-A-0161-04163	ARC-13475 SZE-354-A-6258 TC-761A0038 TRAA-A-0161-04163
E-106Ⓢ	3G100-57	INSULATOR, bushing: tubular NEMA Gr XXX bakelite tubing; p/o attenuator A-107 0.205" lg x 0.619" OD x 0.561" ID	Insulator, thermistor mount	MODE-A-4005A	MODE-A-4005A
E-107	3300-396486942 R16-T-1685-350 N5940-578-4984 8880-600000-1855 R16MODE-A7007A 3Z12101-2	TERMINAL, stud: terminal and contact spring assembly, the spring making contact w/disc thermistor; p/o attenuator sub-assembly A-107; consists of term, mica insulating washers, and contacting spring; 0.446" diam x 0.256" h, o/a	For contacting TH-101	ARC-11260 SZE-354-A-6259 TC-767A0015 MODE-A-7007A TRAA-A-0161-04231	ARC-11260 SZE-354-A-6259 TC-767A0015 MODE-A-7007A TRAA-A-0161-04231
E-108	3300-396486943 R16-T-1685-300 N5940-578-4983 8880-600000-1865 R16MODE-A7029A 3Z12101-3	TERMINAL, stud: term and contact spring assembly, the spring making contact w/disc thermistor, p/o attenuator sub-assembly A-107 consists of term, mica insulating washers, and contacting spring; 0.415" diam x 0.256" h, o/a	For contacting TH-102	ARC-14133 SZE-354-A-6260 TC-767A0015 MODE-A-7029A TRAA-A-0161-04235	ARC-14133 SZE-354-A-6260 TC-767A0015 MODE-A-7029A TRAA-A-0161-04235
E-109	3300-651754380 R16-N-1923 16-N-88601-1042 Shop manufacture†† 7CM3-ME-A5089A 6L3328-27.1	NUT, round: externally threaded round nut; brass, silver plated ½"-27 NS-1 male thd; approx 9/32" thk; ½" OD; 0.295" diam opening one end, 0.422" diam x 0.224" d opening in other end; p/o attenuator sub-assembly A-107	Secures E-108 in place	ARC-14132 SZE-354-A-6308 TC-767A0035 MODE-A-5089A TRAA-A-0161-04234	ARC-14132 SZE-354-A-6308 TC-767A0035 MODE-A-5089A TRAA-A-0161-04234
E-110		TERMINAL, stud: same as E-107	For contacting TH-102		

*Not furnished as a maintenance part for BuShips activities personnel. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
E-111Ⓢ	3G280-87	INSULATOR ASSEMBLY: round laminate nylon disk 1" diam x 3/32" thk; w/two 0.110" diam holes 180° apart on 5/16" radius circle and two #3-48 nuts 90° from each hole on same radius	Mounting for C-122	NEEN-949-3426	NEEN-949-3426
E-111●		INSULATOR, support: rectangular phenolic block 2½" lg x 1⅛" wd x ¼" thick; two 0.0171" diam holes 2⅛" c to c and two No. 4-40 NC-2 tapped holes 1⅜" c to c	Mounting for C-122	TRAA-A-0161-04040	TRAA-A-0161-04040
E-112Ⓝ ●	N5820-604-0736	INSULATOR: varnished cambric; 1-13/32" lg x 3/16" w x 0.0035" thk	Insulator for TH-101	MODE-A-4001 TRAA-A-0161-04233	MODE-A-4001 TRAA-A-0161-04233
E-113Ⓢ		INSULATOR: same as E-112	Insulator for TH-102		
E-114Ⓝ ●	3G320-651 N5820-604-0740	INSULATOR ASSEMBLY: curved black paper base lamicoid, Mica Insulator Co. No. 6072 or equiv; formed to 2¾" lg x 2-1/16" wd x ⅜" h; curved on short axis on 1-7/16" radius; w/two spacers ¾" C to C	Insulator for R-185	MODE-A-5129 TRAA-B-0161-04136	MODE-A-5129 TRAA-B-0161-04136
E-115Ⓝ	R16MODE-A4009E 3G280-88	INSULATOR: bakelite, p/o cavity drive assembly A-114		MODE-A-4009E	MODE-A-4009E
E-116Ⓝ ●		INSULATOR: varnished cambric; 5¾" lg x 3¼" wd x 0.015" thk	Insulator for cover O-128 of switch S-101	NEEN-12449	NEEN-12449
E-117Ⓝ ●	R17T26653-4265N 3Z12073-107.1	TERMINAL, lug: round end w/solder type connection for #14 AWG wire 21/32" lg x ¼" wd x 1/32" thk	For receptacle grounds	Malco Tool & Mfg. Co. Part No. 614 ZE-333●	NE-12435
E-118Ⓢ Ⓝ ●	3300-387256524 R16-B-6549-626 N17-B-77884-7851 Shop manufacture†† R17B77884-7651N 3Z770-8.23	BOARD, terminal: general purpose; consists of ceramic plate, approx 1½" lg x 1-5/32" wd x 3/32" thk; carrying 8 stud-type term, for resistor mtg; inserts #3-48 x 9/64" d on 29/64" mtg/c and 1 strap-type grounding term with solder lug ends approx 1½" lg x 1-5/32" wd x 9/16" h o/a	Mounts R-171, R-190, R-193, R-194	ARC-13025 TC-625A0001 PRME 7003	ARC-13025 TC-625A0001 NEEN-12423
E-118Ⓢ	N17-B-77734-7992*	BOARD, terminal: general purpose; consists of a glass-melamine plate approx 1½" lg x 1-5/32" wd x 1/16" thk; 8 stud-type term; USECO WC1392; mtg inserts, 0.188" diam x 0.281" lg with #3-48 tapped hole, on 29/64" ctrs; 1 strap-type grounding terminal with solder lug ends; MFP per JAN-C-173; 1½" lg x 1-5/32" wd x 9/16" h o/a	Mounts R-171, R-190, R-193, R-194	#1182 Special USEA	SZE-354-A-5020
E-119Ⓢ Ⓝ ●	3300-387256526 R5120-323-2290-S231 N17-B-77884-1501 Shop manufacture†† R17B77884-1461N 3Z770-8.114	BOARD, terminal: general purpose; consists of a ceramic plate, approx ⅞" lg x 23/32" wd x 3/32" thk, carrying 8 stud-type term for resistor mtg; 2 mtg inserts, #3-48 x 9/64" d on 29/64" mtg/c and 1 strap-type grounding term w/solder lug ends; approx 1" lg x 23/32" wd x 9/16" h, o/a	Mounts R-152, R-156, R-157	ARC-12855 TC627A0001 PRME 7001	ARC-12855 TC627A0001 NEEN-12421

E-119⑪	N17-B-77832-5876*	BOARD, terminal: general purpose; consists of a glass melamine plate approx ⅞" lg x 23/32" wd x 1/16" thk; 8 stud-type terms, USECO 2010; 2 mtg inserts 0.188" diam x 0.281" lg with #3-48 tapped hole, on 29/64" ctrs; 1 strap-type grounding terminal with solder lug ends; MFP per JAN-C-173; ⅞" lg x 23/32" wd x ½" h o/a	Mounts R-152, R-156, R-157	#1180 Special USEA	SZE-354-A-5018
E-120③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-151, R-153, R-154, R-155		
E-120⑪		BOARD, terminal: same as E-119⑪	Mounts R-151, R-153, R-154, R-155		
E-121③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-170, R-176, R-177, R-178		
E-121⑪		BOARD, terminal: same as E-119⑪	Mounts R-170, R-176, R-177, R-178		
E-122③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts C-108, R-108, R-111 R-112		
E-122⑪		BOARD, terminal: same as E-119⑪	Mounts C-108, R-108, R-111 R-112		
E-123③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-102, R-103, R-105, R-198		
E-123⑪		BOARD, terminal: same as E-119⑪	Mounts R-102, R-103, R-105, R-198		
E-124③⑨⑫	3300-387256521 R16-B-6549-627 N17-B-77884-1906 Shop manufacture†† R17B77884-1826N 3Z770-8.115	BOARD, terminal: general purpose; consists of ceramic plate approx 1-7/32" lg x 1-1/32" wd x 3/32" thk, carrying 8 stud-type term for resistor mtg; 2 mtg inserts, #3-48 x 9/64" d on 29/64" mtg/c and 1 strap-type grounding term w/solder lug ends; approx 1-7/32 in. lg x 1-1/32" wd x 9/16" h o/a	Mouns C-104, R-106, R-107, R-109	ARC-12856 TC-626A0001 PRME 7002	ARC-12856 TC-627A0001 NEEN-12422
E-124⑪	N17-B-77833-9944*	BOARD, terminal: general purpose; consists of a glass-melamine plate approx 1-7/32" lg x 1-1/32" wd x 1/16" thk; 8 stud-type term, USECO WC-1392, 2 mtg inserts 0.188" diam x 0.281" lg with #3-48 tapped hole, on 29/64" ctrs; 1 strap-type grounding terminal with solder lug ends; MFP per JAN-C-173 1-7/32" lg x 1-1/32" wd x 9/16" h o/a	Mounts R-106, C-104, R-107, R-109	USECO #1181 Special	SZE-354-A-5010
E-125③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-174, R-175, R-199, R-200, R-204		
E-125⑪		BOARD, terminal: same as E-119⑪	Mounts R-174, R-175, -199, R-200, R-204		
E-126③⑨⑫		BOARD, terminal: same as E-118③⑨⑫	Mounts C-105, C-106, C-107, R-113, R-114		

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
E-126⑥		BOARD, terminal: same as E-118⑥	Mounts C-105, C-106, C-107, R-113, R-114		
E-127③⑨⑫		BOARD, terminal: same as E-124③⑨⑫	Mounts C-103, C-127, C-131, R-104		
E-127⑥		BOARD, terminal: same as E-124⑥	Mounts C-103, C-127, C-131, R-104		
E-128③⑨⑫		BOARD, terminal: same as E-118③⑨⑫	Mounts R-181, R-182, R-183, R-184		
E-128⑥		BOARD, terminal: same as E-118⑥	Mounts R-181, R-182, R-183, R-184		
E-129③⑨⑫		BOARD, terminal: same as E-124③⑨⑫	Mounts R-137, R-138, R-139		
E-129⑥		BOARD, terminal: same as E-124⑥	Mounts R-137, R-138, R-139		
E-130③⑨⑫		BOARD, terminal: same as E-124③⑨⑫	Mounts R-150, R-159, R-186, R-187		
E-130⑥		BOARD, terminal: same as E-124⑥	Mounts R-150, R-159, R-186, R-187		
E-131③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-120, R-121, R-122, R-123		
E-131⑥		BOARD, terminal: same as E-119⑥	Mounts R-120, R-121, R-122, R-123		
E-132③⑨⑫		BOARD, terminal: same as E-124③⑨⑫	Mounts C-112, C-114, C-128, R-124, R-195		
E-132⑥		BOARD, terminal: same as E-124⑥	Mounts C-112, C-114, C-128, R-124, R-195		
E-133③⑨⑫		BOARD, terminal: same as E-119③⑨⑫	Mounts R-115, R-116, R-117		
E-133⑥		BOARD, terminal: same as E-119⑥	Mounts R-115, R-116, R-117		
E-134③⑨⑫		BOARD, terminal: same as E-124③⑨⑫	Mounts C-110, R-119, R-126, R-128		

E-134⑥		BOARD, terminal: same as E-124⑥	Mounts C-110, R-119, R-126, R-128		
E-135③ ⑨ ⓬		BOARD, terminal: same as E-118③⑨⓬	Mounts C-109, C-115, R-133, R-134		
E-135⑥		BOARD, terminal: same as E-118⑥	Mounts C-109, C-115, R-133, R-134		
E-136⑧	R17T26687-2289N 3Z12051	TERMINAL, lug: round end w/solder type connection; 23/32" lg x 5/16" wd x 0.2" thk	For grounds	MAKY #784	NEEN-12925-3
E-137③ ⑨ ⓬		BOARD, terminal: same as E-119③⑨⓬	Mounts R-135, R-136, R-172, R-173		
E-137⑥		BOARD, terminal: same as E-119⑥	Mounts R-135, R-136, R-172, R-173		
E-138③ ⑨ ⓬		BOARD, terminal: same as E-119③⑨⓬	Mounts C-116, R-140, R-141, R-142		
E-138⑥		BOARD, terminal: same as E-119⑥	Mounts C-116, R-140, R-141, R-142		
E-139③ ⑨ ⓬		BOARD, terminal: same as E-119③⑨⓬	Mounts C-113, C-126, R-125, R-129		
E-139⑥		BOARD, terminal: same as E-119⑥	Mounts C-113, C-126, R-125, R-129		
E-140③	3300-298362069 R16-I-8410	INSULATOR, plate: diamond-shaped w/acute angles curved to 0.187" rad and obtuse angles to 0.562" rad; white ceramic grade 2; approx 1-15/16" lg x 1⅛" wd x ⅛" thk, 0.382" diam hole in ctr; two 0.141" wd keyways, bottoms ½" from ctr, spaced 45 deg from ctr line of mtg holes; two 0.136" diam mtg holes on 1-9/16" mtg/c	Mounts R-188	ARC-13184	ARC-13184
E-140⑧ ⓬	N17-I-64848-1685 Shop manufacture††	INSULATOR, plate: diamond-shaped w/acute angles curved to 0.187" rad; and obtuse angles to 0.562" rad; XXX Bakelite; approx 1-15/16" lg x 1⅛" wd x ⅛" thk; 0.382" diam hole in ctr; two 0.141" wd keyways, bottoms ½" from ctr, spaced 45 deg from ctr line of mtg holes; two 0.136" diam mtg holes on 1-9/16" mtg/ctrs	Mounts R-188	TC-760A0002 TRAA-A-0161-04034	TC-760A0002 TRAA-A-0161-04034
E-140⑥ ⑨	N17-I-64848-1755* 3G320-349	INSULATOR, plate: same as E-140③ except glass melamine	Mounts R-188	SZE-354-A-6080 NEEN-949-3425	SZE-354A-6080 NEEN-949-3425
E-141③	3300-331265815 R17-I-6980-700 N17-I-69152-7731	INSULATOR, standoff: round post shape; consists of white ceramic grade 2 insulator, axially tapped #3-48 x 0.187" d each end, holes not meeting; w/cad pl brass term thd into one tapped hole, other tapped hole for mtg; approx 11/16" h x 9/32" diam o/a	Mounts C-101	ARC-14556	ARC-14556

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	Stock Number(s)	Name of Part and Description	Function	Mfr. and Desig. or JAN Type	Cont. or Govt. Dwg. or Spec. No.
E-141Ⓝ	R17CGT-X1980XC N17-I-28224-4026	INSULATOR, standoff: ceramic body, Grade L-5 (JAN-I-10), silicone impregnated, cadmium plated brass base with #3-48 x ¼" screw mounting stud, single post terminal; ½" h x 3/16" thk o/a	Mounts C-101	CGTX1980XC	354-A-5032
E-141Ⓝ		INSULATOR, standoff: round post shape; consists of ceramic grade 2 insulator, axially tapped #6-32 x 0.187" d each end, holes not meeting w/cad pl brass term thd into one tapped hole, other tapped hole for mtg; approx 15/16" h x 5/16" diam o/a	Mounts C-101	TC-628A0001	TC-628A0001
E-141Ⓝ ●	R17T28240-4026N 3Z12101-65.1	INSULATOR, standoff: round post shape; phenolic insulator w/#6-32 NC-2 stud one end and cad pl brass term other end; approx 1-3/32" h x 5/16" diam o/a	Mounts C-101	PRME#6000 GAMA-3449-3●	NEEN-12431
E-142	R16-K-3323-259-500 N16-K-700302-575 3320-083350695 R16K3374-35 2Z5822-716	KNOB: round; aluminum, black alumilited; for ¼" diam shaft; single #6-32 NC-2 set screw; engraved w/circle ⅜" diam having 3/32" lg straight line radiating therefrom; 1" diam x ⅜" lg o/a; ⅜" d shaft hole; straight knurl 5/16" lg	Power set	ARC-14540 SZE-354-A-6065 RFLN-A-8162 KK-S-308-64-BB-B-CL●	ARC-14540 SZE-354-A-6065 NEEN-12459
E-142Ⓝ	16-K-700302-560 If required will be procured by nearest Navy Shore Supply Activity on demand††	KNOB: round; aluminum; black alumilited; for ¼" diam shaft; single #6-32 NC-2 set screw; engraved arrow on the ctr line of knob ⅜" lg; 1" diam x ⅜" lg o/a; ⅜" d shaft hole; straight knurl 5" lg	Power set	TC-666A0003	TC-666A0003
E-143		KNOB: same as E-142	Zero set		
E-144	R16-K-3820 N16-K-700248-886 3320-083351082 R16K3505-710-5 5355-644-2139	KNOB: round; aluminum, black alumilited; for 3/16" diam shaft; single #6-32 set screw; engraved w/arrow and word "Lock"; 7/16" diam x 11/32" lg o/a; shaft hole 0.219" d; straight knurl 36 to 40 lineal pitch for 5/32" of lg	Lock for power set knob	ARC-7199 SZE-354-A-6021 TC-665A0010 RFLN-A-8163 TRAA-A-0109-00397	ARC-7199 SZE-354-A-6021 TC-665A0010 NEEN-12458 TRAA-A-0109-00397
E-145		KNOB: same as E-144	Lock for zero set knob		
E-146		KNOB: same as E-144	Lock for frequency knob		
E-147		KNOB: same as E-144	Lock for attenuation knob		

E-148	R16-K-3323-266 N5355-644-1116	KNOB: round, w/pointer; knob and pointer aluminum, black alumilited; for ¼" diam shaft; single #6-32 NC-2 set screw; knob engraved with ⅜" diam circle having 3/32" lg straight line radiating therefrom, pointer engraved with ⅛" lg straight line at tip w/radial line on knob; 1" diam x ⅝" lg, pointer extending 3/16" beyond circumference of knob; ⅜" d shaft hole; straight knurl 5/16" lg	Pulse width	ARC-13786 SZE-354-A-6022 RFLN-A-8161 KK-S-308-64-BB-40275⑮	ARC-13786 SZE-354-A-6022 NEEN-12457
E-148⑧	16-K-700302-563 If required will be procured by nearest Navy Shore Supply Activity on demand††	KNOB: round w/pointer; knob and pointer aluminum; black alumilite; for ¼" diam shaft; single #6-32 NC-2 set screw; engraved arrow on the ctr line of knob ⅝" lg; pointer engraved w/⅛" lg straight line at tip in line w/radial line on knob; 1" diam x ⅝" lg pointer extending 3/16" beyond circumference of knob; ⅜" d shaft hole; straight knurl 5/16" lg	Pulse width	TC-666A0001	TC-666A0001
E-149		KNOB: same as E-148	Pulse rate		
E-150		KNOB: same as E-148	Pulse delay		
E-151⑦	R16-K-3323-258 N16-K-700375-675	KNOB: round w/retractable roller type crank, retained in cranking or withdrawn position by detent ball and spring; aluminum, black alumilited and black enameled; for 3/16" diam shaft; #6-32 NC-2 set screws and single 9/32" lg x 0.068" diam groov pin; approx 1¾" diam x 1-15/32" h w/roller retracted; ⅜" d shaft hole; straight knurled 19-21 lineal pitch; used only on serial numbers 1 through 150 of referenced contract	Signal frequency	ARC-13276 TC-665B0001	ARC-13276 TC-665B0001
E-151	N5355-579-7474 R6625-608-6251-E212	KNOB: round; consists of one round dial 2.0" diam x 0.187" thk; 45 deg angle around edge, 0.812" diam depression w/45 deg angle outward toward edge; face of dial reversed etched w/dull black background; scale divisions 0 to 100 and characters 0.012" wd and bright; onto this dial is secured knob, ARC-13276, E-152; approx 2" diam x 1.755" h, o/a; for all equipments except serial numbers 1 through 150 of Contract No. NOa(s)9748	Signal frequency	ARC-14944 SZE-354-B-6066 NEEN-949-3400 TRAA-A-0161-04092	ARC-14944 SZE-354-B-6066 NEEN-949-3400 TRAA-A-0161-04092
E-152		KNOB: same as E-151⑦	Output attenuator control	ARC-13276 SZE-354-B-6067	ARC-13276 SZE-354-B-6067
E-152⑧ ⑮	7CNE-NE949-3401 R16NEEN-NE949-3401 2Z5822-718 N5355-579-6196 R5355-608-6252-£212	KNOB: round; w/retractable roller type crank, retained in cranking or withdrawn position by detent ball and spring; aluminum, black alumilited and black enamel; for 3/16" diam shaft; two #6-32 NC-2 set screws; approx 1¾" diam x 1-15/16" h o/a w/cranking roller extended, 1" h with roller retracted; ⅜" d shaft hole; straight knurled	Output attenuator control	NEEN-949-3401 KK-S-309-78-BB-B⑮	NEEN-949-3401

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
E-153	R5355-608-6249-E212 N5355-576-8756 3320-083351092 R16NEEN-NE949-3408 2Z5822-719	KNOB: lever type; aluminum, black alumilited and black enameled; for ¼" diam shaft; two #6-32 NC-2 set screws; 1-9/16" lg x ½" wd x ⅝" h o/a; ⅜" d shaft hole	For S-101	ARC-13534 SZE-354-A-6020 NEEN-949-3408 TRAA-A-0161-04097	ARC-13534 SZE-354-A-6020 NEEN-949-3408 TRAA-A-0161-04097
E-153Ⓑ	16-K-700182-651 If required will be procured by nearest Navy Shore Supply Activity on demand††	KNOB: lever type; aluminum, black alumilited and black enameled; for ¼" diam shaft; two #6-32 NC-2 set screws; arrow marking 1-13/16" lg x ⅞" max wd x 11/16" h o/a; ⅜" d shaft hole	For S-101	TC-667A0001	TC-667A0001
E-154Ⓐ	3300-298362070 R16-M-4989-900	INSULATOR, disk: round plate shape; ceramic, silicone varnished; 1" diam x 0.094" thk; two aluminum mtg inserts ⅛" lg, tapped #3-48 NC-1, located 180 deg apart on ⅝" diam circle, two 0.120" diam holes 180 deg apart on ⅝" diam circle 90 deg from mtg inserts	Mounts C-117 or C-122	ARC-13642	ARC-13642
E-154Ⓑ	3320-081800060 N17-I-57530-8111	INSULATOR, disk: round plate shape; XXX Bakelite 1" diam x ⅛" thk; two aluminum mtg inserts ⅛" lg, tapped #3-48 NC-1, located 180 deg apart on ⅝" diam circle, two 0.120" diam holes 180 deg apart on ⅝" diam circle, 90 deg from mtg inserts	Mounts C-117	TC-216A0011	TC-216A0011
E-154Ⓑ Ⓒ	R17T26653-4520N 3Z12073-107	TERMINAL LUG: round end w/solder type connection for #14 AWG wire; 5/16" lg x ¼" wd x ⅜" high	For grounds	MAKY #628 ZE-417Ⓒ	NEEN-12689-3
E-155	3300-287641463 R6625-608-8964-E212 N16-C-69001-1015 Shop manufacture†† R16MODE-A-7051 2Z3262-95	CORE: p/o shaft bearing assembly on attenuator sub-assembly A-107; high frequency iron molded w/insulating binder; 0.375" OD x 0.196" ID x 0.250" lg	Suppresses r-f leakage from shaft 0-131	ARC-11426 SZE-354-A-6261 TC-767A0028 MODE-A-7051 TRAA-A-0161-04243	ARC-11426 SZE-354-A-6261 TC-767A0028 MODE-A-5041 TRAA-A-0161-04243
E-156		Not used			
E-157		Not used			
E-158	R5960-272-9092-F632 N5960-669-8808 3370-774000-1975 5960-243-0695	SHIELD, tube: brass shield, nickel pl, SS spring; cylindrical, ½" diam hole on top; two "J" openings to engage bayonets for mtg; 0.812" ID x 1¾" h	For V-117	TS102U03	JAN-S-28A

E-158⊛	3300-295579002 R16-S-3934 N16-S-34607-9400 For replacement use SNSN N16-S-34607-6039††	SHIELD, tube: brass shield, nickel pl, SS spring; cylindrical, ½" diam hole on top; two "J" openings to engage bayonets for mtg; 0.812" ID x 1¾" h	For V-117	TSF0T103	JAN-S-28A
E-159		SHIELD, tube: same as E-158	For V-118		
E-159⊛		SHIELD, tube: same as E-158⊛			
E-160		SHIELD, tube: same as E-158	For V-119		
E-160⊛		SHIELD, tube: same as E-158⊛			
E-161		SHIELD, tube: same as E-158	For V-120		
E-161⊛		SHIELD, tube: same as E-158⊛			
E-162		SHIELD, tube: same as E-158	For V-122		
E-162⊛		SHIELD, tube: same as E-158⊛			
E-163		CORE: same as E-155	Suppresses r-f leakage from shaft O-131		
E-164		CORE: same as E-155	Suppresses r-f leakage from shaft O-131		
E-165		CORE: same as E-155	Suppresses r-f leakage from shaft O-131		
E-166 to E-174		See Accessories Parts List			
E-175⑨		INSULATOR, disk: 1" diam x 3/32" thk; w/two .110" diam holes 180 deg apart and two .1405" diam holes 180 deg apart on 5/16" rad	Mounts C-122	NEEN-949-3429	NEEN-949-3429
F-101⊙	8800-361212 17-F-16310 N17-F-16302-120	FUSE, cartridge: 3 amp; one time; glass body; ferrule term, 1/4" diam x 1-7/32" lg o/a; term 1/4" diam x 1/4" lg type 3AG	A-C input	BUS-3AG LIT-312003	ARC-8434 TC-860A0015
F-101⊜ ⑨ ●	8870-112000-822 G17F16302-120 3Z2603.2	FUSE, cartridge; 3 amp; one time; glass body, ferrule term, 1/4" diam x 1-7/32" lg o/a; term 1/4" diam x 1/4" lg type AGC3	A-C input	BUS AGC3 F02G3R00A●	ARC-8587 SZE-354-A-5016 MIL-F-15160●
F-102⊙		FUSE, cartridge: same as F-101⊙	A-C input		
F-102⊜ ⑨ ●		FUSE, cartridge: same as F-101⊜	A-C input		

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
F-103⑦		FUSE, cartridge: same as F-101⑦	Spare fuse		
F-103② ⑨ ⑫		FUSE, cartridge: same as F-101②	Spare fuse		
F-104⑦		FUSE, cartridge: same as F-101⑦	Spare fuse		
F-104② ⑨ ⑫		FUSE, cartridge: same as F-101②	Spare fuse		
H-101	3300-651964975 R16-N-1923-5 N16-N-87127-2501* Shop manufacture†† R16MODE-A5029A 6L3894-27.1	NUT: straight knurled; brass, nickel pl; ⅞" -27 NS1 thd; ⅜" thk; 1" OD before knurling; 0.531" diam opening in back; p/o cavity sub-assembly A-106	Retains Z-104	ARC-11190 SZE-354-A-6252 TC-762A0061 MODE-A-5029A TRAA-A-0161-04217	ARC-11190 SZE-354-A-6252 TC-762A0061 MODE-A-5029A TRAA-A-0161-04217
H-102③		SCREW, machine: slot drive; fillister hd; SS; #3-48; 0.334" lg; threaded portion ¼" lg; 0.153" diam hd w/0.032" wd x 0.034" d slot	Retains end plate in cavity barrel	ARC-8537	ARC-8537
H-102⑥ ⑨	6L6348-4.23	SCSEW, machine: slot drive; binding hd; brass, nickel pl; #3-48 x 3/16" lg	Retains end plate in cavity barrel	SZE-354-A-6115 MODE-A-9002	SZE-354-A-6115 MODE-A-9002
H-103③		SCREW, machine: same as H-102③	Retains end plate in cavity barrel		
H-103⑥		SCREW, machine: same as H-102⑥	Retains end plate in cavity barrel		
H-104③		SCREW, machine: same as H-102③	Retains end plate in cavity barrel		
H-104⑥		SCREW, machine: same as H-102⑥	Retains end plate in cavity barrel		
H-105	3300-651921035 R6625-608-8959-E222 N16-N-87184-9501 7CM3-ME-A-5028 R16MODE-A5028 5310-392-8224	NUT, lock: ring type nut, straight knurled, with captive row of bearing balls; 18-8SS; 1⅛" -48 NS-1 female thd; ½" thk; 1.906" OD before knurling; p/o cavity sub-assembly A-106	Ball nut for tube housing	ARC-11145 SZE-354-B-6263 TC-762A0034 MODE-A-5028 TRAA-A-0161-04276	ARC-11145 SZE-354-B-6263 TC-762A0034 MODE-A-5028 TRAA-A-0161-04276

H-106	3300-298409577 R16-F-2075 N16-G-671501-1019 If failure occurs, requisition a replacement part from ESO, referencing NavShips 900,1803 as authority†† 6625-512-9624	SUB-ASSEMBLY: tube socket and choke assembly; p/o cavity sub-assembly A-106; comprises a four contact tube socket, 4 contacts on 13/32" diam pin circle w/contacts, 1 and 3 in line with slots in mtg plate, socket mtd in a silver-plated cylindrical brass shell which carries three coaxial chokes Z-101, Z-102, Z-103, which radiate in a plane perpendicular to axis of shell and are spaced 60 deg apart; three insulated RF chokes L-106, L-107, L-108; base of shell closed by a threaded plug H-123; shell approx 1¾" diam x 1⅞" lg o/a with three ½" diam coaxial chokes radiating outward approx 1-11/16" from the surface of shell; mtd by clamping end of shell in end of cavity shell (listed for reference only for contract No. N383s-60879 and N383s-61060)	For V-111	ARC-13687 SZE-354-C-6266 TC-762-B0007 MODE-B-7053 TRAA-B-0161-04250	ARC-13687 SZE-354-C-6266 TC-762B0007 MODE-B-7053 TRAA-B-0161-04250
H-106A	R16SZE-354-B-6360	SOCKET: shell with cover, socket, no chokes; H-106 less chokes		ARC-No number SZE-354-B-6360 TRAA-A-0161-04254	ARC-No number SZE-354-B-6360 TRAA-A-0161-04254
H-106A◉	2Z8674.197	SOCKET ASSEMBLY: same as H-106 but without choke Z-101, Z-102, Z-103 and plug H-123		MODE-A-5155A	MODE-A-5155A
H-107		NUT: same as H-101	Secures attenuator sub-assembly A-107 to cavity sub-assembly A-106		
H-107◉ ●	R16MODE-A5169A 6L3894-27.1	NUT: round type, straight knurled, brass nickel plate, ⅝" diam opening one end; ⅞-27 NS-2 internal thd other end; 1" OD before knurling, ⅜" lg o/a		MODE-A-5169A TRAA-A-0161-04275	MODE-A-5169A TRAA-A-0161-04275
H-108	3300-651952550 R16-N-1923-10 N16-N-87117-3220* Shop manufacture††	NUT, thumb: straight knurled round nut, back partly closed; brass, nickel pl; ¾"-20 NEF-1; 0.312" thk; ⅞" OD before knurling; 0.513" diam opening in back; p/o cavity A-105	Retains Z-105	ARC-13322 SZE-354-A-6267 TC-761A0037 TRAA-A-0161-04147	ARC-13322 SZE-354-A-6267 TC-761A0037 TRAA-A-0161-04147
H-108◉	R16MODE-A5047B 6L3812-20.1	NUT, thumb: diamond knurled round nut, back partly closed; brass, 0.312" thk, ⅞" OD before knurling, silver pl ¾"-20 NS-2; 0.531" diam opening in back, p/o Attenuator A-107	Retains Z-105	MODE-A-5047B	MODE-A-5047B
H-109		NUT: round type; consists of 0.010" thk yellow brass ring 0.445" diam max x 0.125" lg reduced to 0.266" diam x 0.094" lg; black neoprene washer 0.437" OD x 0.219" ID x 0.100" thk; and half-hard brass nickel pl nut, diamond knurl, 19 to 21 lineal pitch; 0.594" OD before knurling, ½" x 27 thd followed by 0.453" diam and then 0.295" diam; ring and washer inserted with projecting end of ring flared to 21/64" OD	Secures attenuator cable to bushing H-110	ARC-13783 SZE-354-A-6268	ARC-13783 SZE-354-A-6268
H-109◉ ●		NUT AND RING ASSEMBLY: consists of H-109A and H-109B	Secures attenuator cable to bushing H-110	TRAA-A-0161-04187	TRAA-A-0161-04187
H-109A◉ ●	R16MODE-A5032A 5310-550-1856	NUT: round type; diamond knurled, 19/32" diam before knurling, ½-27 NS-2 thd one end, 0.295" diam opening, other end, 5/16" lg		MODE-A-5032A TRAA-A-0161-04189	MODE-A-5032A TRAA-A-0161-04189

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-109B⑧ ●	R16MODE-A5084 3F31560-4	RING ASSEMBLY: aluminum ring 0.445" diam for 0.125" reduced to 0.286" diam for 0.094"; surface between changed diameters flat; w/black neoprene washer 0.437" OD x 0.219" ID x 0.100" thk, cemented in ring		MODE-A-5084 TRAA-A-0161-04188 and TRAA-A-0161-04190	MODE-A-5084 TRAA-A-0161-04188 and TRAA-A-0161-04190
H-110	N16-800188-185	BUSHING: feed-through type; 17ST aluminum alloy; 1.062" diam max x 0.563" h o/a; ⅞"-24 NS-1 thd for 0.219" lg, followed by shoulder 0.094" h x 1.062" diam, followed by ½" -27 NS-1 thd for remainder, 0.219" diam hole through center w/end flared at ⅞" -24 NS-1 threaded end w/0.219" rad outward toward edge; 0.046" diam hole through shoulder for pin	Feeds attenuator cable through chassis	ARC-13788 SZE-354-A-6269	ARC-13788 SZE-354-A-6269
H-110⑧ ●	R16MODE-A5045F 2Z1409-302	Same as H-110 except no hole for pin		MODE-A-5045F TRAA-A-0161-04191	MODE-A-5045F TRAA-A-0161-04191
H-111	6L2444-24-17 5310-639-8232	NUT: round type, straight knurl; 1.062" OD before knurling x 0.125" thk max, 0.020"; h portion top and bottom 45 deg chamfer; ⅞" x 24 internal thd	Secures bushing H-110 to chassis	ARC-9327 SZE-354-A-6270 MODE-A-5014A TRAA-A-0161-04192	ARC-9327 SZE-354-A-6270 MODE-A-5014A TRAA-A-0161-04192
H-112	N17-P-69841-8201* Shop manufacture†† 2Z7259-234	POST: support; half-hard brass, nickel pl; 7.032" lg x 0.250" diam, o/a; w/#8-32 NC-1 female thd; 0.125" lg one end, other end #6-32 NC-1 thd, ⅜" d	Secures attenuator subassembly A-107 to plate A-101	ARC-13477 SZE-354-A-6271 TC-761A0028 MODE-A-5057 TRAA-A-0161-04139	ARC-13477 SZE-354-A-6271 TC-761A0028 MODE-A-5057 TRAA-A-0161-04139
H-113	17-P-69783-4961* Shop manufacture††	POST: support; half-hard brass, nickel pl; 3.250" lg x 0.250" diam, o/a; w/#8-32 NC-1 male thd 0.156" lg on one end, other end #6-32 NC-1 thd, ⅜" d	Secures attenuator subassembly A-107 to chassis	ARC-13481 SZE-354-A-6272 MODE-A-5059 TRAA-A-0161-04140	ARC-13481 SZE 354-A-6272 MODE-A-5059 TRAA-A-0161-04140
H-114	3300-299442719 R16-S-8858 17-S-46765-6043* Shop manufacture†† 6625-512-9628	SPRING: flat type; provides detent action; 0.020" thk beryllium copper, nickel pl; approx ⅞" lg x 7/16" wd x 0.156" formed height; two 0.120" diam mtg holes on ⅝" mt/c; p/o attenuator assembly A-107	Rack loading spring	ARC-13798 SZE-354-A-6273 TC-767A0022 MODE-A-5086 TRAA-A-0161-04229	ARC-13798 SZE-354-A-6273 TC-767A0022 MODE-A-5086 TRAA-A-0161-04229
H-115	3300-286675186 R16-N-1923-15 16-N-87098-4851* Shop manufacture††	NUT, round: smooth sides; brass, silver plated; ½" -27 NS-1 thd; 0.312" thk; 0.594" OD; 0.295" diam opening in back; p/o attenuator sub-assembly A-107	For TH-101 mount, retains E-107	ARC-11239 SZE-354-A-6245 TC-767A0032 TRAA-A-0161-04230	ARC-11239 SZE-354-A-6245 TC-767A0032 TRAA-A-0161-04230
H-115⑧		NUT, round: same as H-109A	Retains E-107		

H-116	3300-291703645 R16-H-8325-525 16-C-599931-165* Shop manufacture†† 2Z5180-14	HUB: hub for shafts of cavity tuning and attenuator drives; p/o cavity assembly A-105; 18-8SS; 0.562" OD on 0.025" wd flange, 0.498" diam body w/undercut 0.040" wd x 0.484" diam adjacent flange, 0.297" lg o/a; 0.1875" diam hole counterbored 0.406" diam x 0.025" d on end opposite flange; secured by two #6-32 NC-2 set screws	Frequency dial lock drum	ARC-13478 SZE-354-A-6083 TC-761A0030 MODE-A-5135	ARC-13478 SZE-354-A-6083 TC-761A0030 MODE-A-5135
H-117		HUB: same as H-116 (listed for reference only for Contract No. N383s-60879 and N383s-61060)	Attenuator dial lock drum		
H-118	3300-291703644 R16-H-8324-600 N16-S-685901-121 Shop manufacture††	HUB: p/o attenuator drive; consists of a hub and one tumbler, the tumbler pressed on hub and riveted by two groov pins 3/64" diam x ⅛" lg; brass, nickel pl; no dimension of this item greater than one inch; mtd on shaft by two #6-32 NC-2 set screws	Attenuator stop mechanism	ARC-13741 SZE-354-A-6211 TC-761A0024	ARC-13741 SZE-354-A-6211 TC-761A0024
H-118⑧ ⑫	7CM3-ME-A-5126 R16MODE-A5126 6625-310-2324	HUB ASSEMBLY: same as H-118 except hub and tumbler soldered together	Attenuator stop mechanism	MODE-A-5126 TRAA-A-0161-04106	MODE-A-5126 TRAA-A-0161-04106
H-119	† For reference only††	SUB-ASSEMBLY: lock tumbler; consists of eleven free tumblers which together with a similar tumbler rigidly attached to a hub H-118 form a range limiting stop which permits the attenuator drive shaft to make ten complete revolutions from full CCW to full CW positions and vice versa; p/o drive mechanism for attenuator assembly on cavity assembly A-105 (listed for reference only for Contract No. N383s-60879 and N383s-61060)	Attenuator stop mechanism		
H-119A	3300-698420180 R16-W-916 N43-W-5300-4535 If required will be procured by nearest Navy Shore Supply Activity on demand†† R16MODE-A5120 6Z8776	TUMBLER, lock: p/o H-119; brass, nickel pl; washer-shaped w/projecting rectangular tab bent at 90° to washer-like portion; no dimension of this part greater than one inch	Range limiting stop, attenuator stop mechanism	ARC-10837 SZE-354-A-6139 TC-761A0026 MODE-A-5120 TRAA-A-0161-04108	ARC-10837 SZE-354-A-6139 TC-761A0026 MODE-A-5120 TRAA-A-0161-04108
H-119B		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119C		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119D		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119E		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-119F		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119G		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119H		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119I		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119J		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-119K		TUMBLER, lock: same as H-119A	Range limiting stop, attenuator stop mechanism		
H-120		HUB: gear mtg; 17S-T aluminum alloy; 0.562" diam max x 0.741" lg, o/a; 0.376" diam hole, 0.312" d, one end; other end turned to 0.2495" diam x 0.078" lg followed by 0.038" h x 0.373" diam shoulder and drilled with 0.213" diam hole x 0.094" d; followed by 0.047" h x 0.562" diam shoulder; followed by 0.373" diam x 0.156" h portion; 0.562" diam x 0.422" h portion has two #6-32 NC-2 tapped holes 90° apart for set screws	Part of gear assembly O-115	ARC-13474 SZE-354-A-6166 MODE-A-5139 TRAA-A-0161-04206	ARC-13474 SZE-354-A-6166 MODE-A-5139 TRAA-A-0161-04206
H-121	3300-287222610 R16-WE-3974 N17-S-46764-4959	CLIP: flat forked type; beryllium copper, cadmium pl; 37/64" lg x 5/16" wd x 0.016" material thk, the two fingers of the forked portion bent at 15 deg angle from plane of clip to give clip an o/a thickness of approx 1/16" opening between fingers of forked end 0.130"	Retains gear assembly O-119	ARC-3974 SZE-354-A-6160 TC-761A0022 MODE-A-5123 TRAA-A-0161-04215	ARC-3974 SZE-354-A-6160 TC-761A0022 MODE-A-5123 TRAA-A-0161-04215
H-122	R16-C-37384-300 N16-C-145098-586* Shop manufacture†† 6625-513-0073	PLUG, machine thread: closure for assembly and inspection port in block on attenuator sub-assembly p/o attenuator sub-assembly A-107; consists of brass plug and two brass pins, silver pl; 1-3/16" diam x 5/16" h, o/a; male mtg thread 1⅛" -48 NS-1, 0.094" lg including 0.032" wd under-cut at shoulder	Back cover for pickup cam housing	ARC-13670 SZE-354-A-6238 MODE-A-5076 TC-761A0019 TRAA-A-0161-04239	ARC-13670 SZE-354-A-6238 MODE-A-5076 TC-761A0019 TRAA-A-0161-04239
H-123	6625-309-3507 N5985-581-2071 Shop manufacture†† R6625-608-8965-E222	PLUG, machine thread: closure for shell of socket assembly, consists of brass plug and two brass pins, silver pl; 1¾" diam x 5/16" h, o/a male mtg thd 1-11/16" -48 NS-1, 0.094" lg including 0.032" wd undercut at shoulder	Back cover for tube housing H-106	ARC-11224 SZE-354-A-6242 TC-762A0010 MODE-A-5030 TRAA-A-0161-04256	ARC-11224 SZE-354-A-6242 TC-762A0010 MODE-A-5030 TRAA-A-0161-04256

H-124	R15-C-37384-275 N17-C-200101-101 Shop manufacture††	PLUG, machine thread: closure for assembly and inspection port in block on attenuator sub-assembly, p/o attenuator sub-assembly A-107; brass silver pl; 11/16" diam x 11/16" thk; male mtg thd ⅜" -48 NS-1, 0.109" lg including 0.047" wd undercut at shoulder; two 0.070" diam holes 0.047" d on ⅜" mtg/c for tightening plug in sub-assembly	Top cover for pickup cam housing	ARC-13492 SZE-354-A-6243 TC-767A0018	ARC-13492 SZE-354-A-6243 TC-767A0018
H-124Ⓢ Ⓡ	R16MODE-A9037 6625-513-0074	PLUG, machine thread: closure for assembly and inspection port in block on attenuator sub-assembly A-113; p/o attenuator assembly A-107; brass, silver pi, ½" diam x 23/64" lg o/a; male mtg thd 5/16-32 NS-2, 0.265" lg, ¼" diam hole, 5/64" d in end; slot drive	Top cover for pickup cam housing	MODE-A-9037 TRAA-A-0161-04238	MODE-A-9037 TRAA-A-0161-04238
H-125	3300-657791543 R16-S-2302 N43-S-7169-1250*	SCREW, machine: slot drive; brass, cadmium plated #3-48 NC-2 thd; 0.156" lg threaded portion; 0.187" diam x 0.125" h head, slot 0.047" wd x 0.062" d, chamfered 45 deg to 0.031" flat, semi-finished	Holds attenuator rack loading spring, H-114	ARC-14585 SZE-354-A-6274	ARC-14585 SZE-354-A-6274
H-125Ⓜ	17-T-28280-3101 Shop manufacture††	SCREW, machine: slot drive: brass, silver pl; #3-48 NC-2 thd; 3/16" lg threaded portion; 0.187" diam x 3/16" lg threaded portion; 0.187" diam x 3/16" h head slot 0.047" wd x 0.125" d, chamfered 45 deg to 0.016" flat, semi-finished	Holds attenuator rack loading spring H-114	TC-767A0021	TC-767A0021
H-125Ⓢ	6L6348-3.4	SCREW, machine: slot drive; brass, nickel pl, #3-48 NC-2 thd, 3/16" lg threaded portions, 0.160" diam x 0.070" h fillister head	Holds attenuator rack loading spring H-114	AN500PB3-3	AN500PB3-3
H-126	3300-65668247 R16-W-1620 R16SZE-354A6162 N43-W-7509-3550*	WASHER, spring: spring temper nickel silver; round; 0.193" ID, 0.437" OD, 0.005" thk; curved to o/a h of 0.061"	For H-118	ARC-5171 SZE-354-A-6162 MODE-A-9013 TRAA-A-0161-04110	ARC-5171 SZE-354-A-6162 MODE-A-9013 TRAA-A-0161-04110
H-127	3300-657850127 R16-W-1053 N43-W-7702-75* 6L58023-33	WASHER, flat: 18-8SS; round: 0.192" ID x 0.281" OD x 0.005" thk	For O-118	ARC-7117 SZE-354-A-6158 MODE-A-9014 TRAA-A-0161-04109	ARC-7117 SZE-354-A-6158 MODE-A-9014 TRAA-A-0161-04109
H-128	3300-656437860 R16-W-1052 N43-W-7509-6570* 6L59713	WASHER, flat: spring temper nickel silver; round; 0.192" ID x 0.344" OD x 0.010" thk	For O-117 and O-118	ARC-5142 SZE-354-A-6159 MODE-A-9012 TRAA-A-0161-04111	ARC-5142 SZE-354-A-6159 MODE-A-9012 TRAA-A-0161-04111
H-129		WASHER, spring: same as H-126	For H-117 and N-102		
H-130		WASHER, flat: same as H-128	For O-114		

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 MAJOR ASSEMBLY: SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-131	3300-656437880 R16-W-1054 N43-W-7509-7810*	WASHER, flat: spring temper nickel silver; round; 0.562" OD x 0.1935" ID x 0.008" thk	For H-150 and N-101	ARC-1053 SZE-354-A-6161	ARC-1053 SZE-354-A-6161
H-131Ⓑ	6L59719	WASHER: flat: same as H-131 except .010" thk	For H-150 and N-101	MODE-A-5124	MODE-A-5124
H-132	N17-C-200101-101	SCREW, machine: slot drive; Bind H; brass, black oxidize; threaded portion ⅜" lg; slot 0.044" wd x 0.048" d	Secures A-101 to front panel	ARC-116(⅜) SZE-354-A-6122	ARC-116(⅜) SZE-354-A-6122
H-132Ⓑ	6L6632-6.11	SCREW, machine: slot drive, brass, black nickel plate thd portion ⅜" lg; 0.260" diam max x ⅜" lg, 6-32 thd; Binder Head	Secures A-101 to front panel	Commercial	
H-133		SCREW, machine: same as H-132	Secures A-101 to front panel		
H-133Ⓑ		SCREW, machine: same as H-132Ⓑ	Secures A-101 to front panel		
H-134		SCREW, machine: same as H-132	Secures A-101 to front panel		
H-134Ⓑ		SCREW, machine: same as H-132Ⓑ	Secures A-101 to front panel		
H-135		SCREW, machine: same as H-132	Secures A-101 to front panel		
H-135Ⓑ		SCREW, machine: same as H-132Ⓑ	Secures A-101 to front panel		
H-136		SCREW, machine: same as H-132	Secures A-101 to front panel		
H-136Ⓑ		SCREW, machine: same as H-132Ⓑ	Secures A-101 to front panel		
H-137		SCREW, machine: same as H-132	Secures A-101 to front panel		
H-137Ⓑ		SCREW, machine: same as H-132Ⓑ	Secures A-101 to front panel		
H-138	R16-S-2301 43-S-52959-1705* R16-S-2189-550 6L4770-8.8KS R5305-579-4591-E222	SCREW, captive: knurled thumb head w/slot 1/16" wd x 1/16" d, finished; SS; #10-32 NF-2; 17/32" lg; threaded portion ¼" lg; 7/16" diam x 3/16" thk head, straight knurled at 28-32 lineal pitch; unthreaded portion of shank ⅛" diam x 9/32" lg; chamfered to from 90 deg angle to 0.031" diam end	Secures equipment chassis to case	ARC-13996 SZE-354-A-5023 NEEN-959-3338 TRAA-A-0161-04015	ARC-13996 SZE-354-A-5023 NEEN-949-3338 TRAA-A-0161-04015
H-138Ⓑ	43-S-52959-1705 Shop manufacture††	SCREW, captive: knurled thumb head w/slot 1/16" d, finished; SS; #10-32 NF-2; 21/32" lg; threaded portion ¼" lg; 7/16" diam x 7/32" thk head, straight knurled at 28-32 lineal pitch unthreaded portion of shank ⅛" diam x 3/16" lg; chamfered to form 90° angle to 0.020" diam end	Secures equipment chassis to case	TC-804A0038	TC-804A0038

H-139		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-139⊙		SCREW, captive: same as H-138⊙			
H-140		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-140⊙		SCREW, captive: same as H-138⊙			
H-141		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-141⊙		SCREW, captive: same as H-138⊙			
H-142		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-142⊙		SCREW, captive: same as H-138⊙			
H-143		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-143⊙		SCREW, captive: same as H-138⊙			
H-144		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-144⊙		SCREW, captive: same as H-138⊙			
H-145		SCREW, captive: same as H-138	Secures equipment chassis to case		
H-145⊙		SCREW, captive: same as H-138⊙			
H-146		Not used			
H-147		SCREW, machine: slot drive; RH; brass, bright nickel pl; threaded portion ⅜" lg; slot 0.039" wd x 0.058" d; 0.250" diam max x 0.472" lg, o/a	Secures cavity to chassis	ARC-106(⅜) SZB-354-A-6123	ARC-106(⅜) SZB-354-A-6123
H-147⊙	6L6632-6.11	SCREW, machine: slot drive, brass, bright nickel pl; threaded portion ⅜" lg BH, #6-32 NC-2 x ⅜"	Secures cavity to chassis	Commercial	Commercial
H-148		SCREW, machine: same as H-147	Secures cavity to chassis		
H-148⊙		SCREW, machine: same as H-147⊙			
H-149		SCREW, machine: slot drive RH., brass, bright nickel pl; threaded portion 1-1/16" lg; slot 0.039" wd x 0.058" d; 0.250" diam max x 0.472" lg, o/a	Secures cavity to chassis	ARC-106(1-116) SZB-354-A-6188	ARC-106(1-116) SZB-354-A-6188
H-149⊙	6L6632-17.67	SCREW, machine: slot drive; RH; brass, bright nickel pl; threaded portion 1-1/16" lg, #6-32 NC-2 thread	Secures cavity to chassis	Commercial	Commercial

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-150		WASHER, flat: same as H-127	For H-116 and H-131		
H-151		WASHER, flat: same as H-131	For O-116		
H-152		WASHER, spring: same as H-126	For O-112 & back plate bushing		
H-153		WASHER, spring: same as H-126	For O-130 and attenuator polyiron core E-155		
H-154		WASHER, flat: same as H-128	For O-110 and attenuator block		
H-154Ⓗ		WASHER, flat: same as H-127			
H-155		WASHER, flat: same as H-128	For O-109 and attenuator block		
H-155Ⓗ		WASHER, flat: same as H-127			
H-156	16R-651091-384 Shop manufacture††	RING, retaining: half-hard brass; ⅜" OD x 0.4370" ID; ⅝" -48 NS-2 thread; two slots 180 deg from each other on axis 0.047" wd x 0.047" d. Not replaceable in 9	Mounts worm bearing race H-157	ARC-13270 SZE-354-A-6275 TC-762A0057 TRAA-A-0161-04313	ARC-13270 SZE-354-A-6275 TC-762A0057 TRAA-A-0161-04313
H-157	R16ARC-10204 N16-R-500371-196* Shop manufacture††	RACE: bearing; steel SAE X-1314, heat treated; ⅝" diam max x 0.0188" h, o/a; ⅜" diam hole for 0.080" lg, followed by 0.324" diam hole 0.108" lg; outer surface at 0.324" diam hole and turned to 0.4375" diam for 0.078" lg, edges chamfered at end of hole 45 deg for 0.010" lg	Worm bearing race	ARC-10204 SZE-354-A-6276 TC-762A0052 TRAA-A-0161-04314	ARC-10204 SZE-354-A-6276 TC-762A0052 TRAA-A-0161-04314
H-157Ⓗ	7CM3-ME-A-5018 R16MODE-A5018 3F1776A	RACE ASSEMBLY: bearing; externally threaded brass retainer, ⅝-48 NS-2, slotted one end w/3/64" x 3/64" slots; ⅜" lg x 0.437" ID; w/drill rod race, SAE-52100, formed to 0.596" OD, one end reduced to 0.4375" OD x 0.324" ID and externally chamfered 45 deg; other end full OD for 0.188" w/0.500" ID hole 0.030" d, rounded on inner edge on 0.015" radius and holding twenty-one 0.0625" diam ball bearings.	Worm bearing race and ball bearings	ME-A-5018	ME-A-5018
H-157AⒽ	3F1766A-1	BEARING RACE: same as H-157Ⓗ w/o ball bearings	Worm bearing race	ME-A-5208	ME-A-5208
H-158	R16ARC-13409 N16-N-87901-1024 6L3510-48-12H	NUT: retaining; half-hard brass, nickel pl; ¾" OD x 0.078" thk; ⅝"-48 NS-2 thd; hex shape; flats 15 deg each side to ctr of thickness	Locks H-157 to O-129	ARC-13409 SZE-354-A-6277 TC-762A0060 MODE-A-9025B TRAA-A-0161-04315	ARC-13409 SZE-354-A-6277 TC-762A0060 MODE-A-9025B TRAA-A-0161-04315

H-159	R6625-[illegible]35-E222 17S-46730-7201* Shop manufacture†† 2Z8877.813	SPRING: coil type; 0.016" diam, hard drawn SS; 24¼ active turns; 0.875" extended lg, ⅜" free lg; 0.172" OD; wound left hand, terminating in loops after crossing center	Anti-backlash on power set mechanism	ARC-14785 SZE-354-B-6278 TC-767A0040 MODE-A-5091A TRAA-A-0161-04244	ARC-14785 SZE-354-B-6278 TC-767A0040 MODE-A-5091A TRAA-A-0161-04244
H-160	R16SZE-354A6279 N16-S-118171-110* Shop manufacture††	SCREW, drive: 18-8SS; threaded portion 0.078" lg, unthreaded portion 0.156" lg; slot drive; flat head 0.062" h w/0.020" wd x 0.031" d slot, 0.125" diam; 90 deg vee cut with reference to axial center of head; unthreaded portion chamfered a end 45 deg x 0.008", 0.0620" diam; approx 0.125" diam max x 0.296" lg, o/a	Driving link between O-131 and Y-103	ARC-14782 SZE-354-B-6279 TC-767A0027	ARC-14782 SZE-354-B-6279 TC-767A0027
H-160①⑪	6L5014-4-1	SCREW, drive: same as H-160 except w/o 90° vee cut	Driving link between O-131 and Y-103	MODE-A-9028A TRAA-A-0161-04248	MODE-A-9028A TRAA-A-0161-04248
H-161		WASHER, flat: same as H-127	For O-131 and attenuator block		
H-162		SCREW, machine: same as H-102	Retains end plate in cavity barrel		
H-163		SCREW, machine: same as H-102	Retains end plate in cavity barrel		
H-164		SCREW, machine: same as H-102	Retains end plate in cavity barrel		
H-165	N16-C-600001-365* 2Z8552-133	BUSHING: spacer type; 17ST aluminum; ¼" OD x 0.687" lg; 0.144" diam hole drilled through length	Spacer for H-113	ARC-2067 SZE-354-A-6173 MODE-A-5134A TRAA-A-0161-04141	ARC-2067 SZE-354-A-6173 MODE-A-5134A TRAA-A-0161-04141
H-166		SCREW, machine: same as H-125	Holds attenuator rack loading spring H-114		
H-167		WASHER, spring: same as H-126	For H-118		
H-168		WASHER, flat: same as H-127	For O-118		
H-169		WASHER, flat: same as H-127	For O-118		
H-170		WASHER, flat: same as H-128	For O-117 and O-118		
H-171		WASHER, spring: same as H-126	For H-117 and N-102		
H-172		WASHER, flat: same as H-128	For O-114		
H-173		WASHER, flat: same as H-127	For H-131 and H-150		
H-174		WASHER, flat: same as H-127	For O-131 and attenuator block		

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-175	3300-299442718 R6625-606-6240-E222 N17-S-46720-6851 Shop manufacture†† 2Z8877.185	SPRING: coil type; 0.016" diam 18-8SS, or beryllium copper; 15 active turns; 13/32" free length inside hooks; 0.090" OD of coils; one hook each end extended from coils 0.040" w/0.029" inside rad	Anti-backlash	ARC-3984 SZE-354-A-6142 TC-764A0004 MODE-A-5066 TRAA-A-0161-04120	ARC-3984 SZE-354-A-6142 TC-764A0004 MODE-A-5066 TRAA-A-0161-04120
H-176		SPRING: same as H-175	Anti-backlash		
H-177		SPRING: same as H-175	Anti-backlash		
H-178		SPRING: same as H-175	Anti-backlash		
H-179		SPRING: same as H-175	Anti-backlash		
H-180	R5960-249-4973-E212 N5960-249-4973 2Z2642.170	CLAMP: electron tube clamp; SS; one mtg hole approx 5/16" lg x 3/16" wd; approx 2-1/8" lg closed, 2¾" lg open x 1⅜" wd x 27/32" h, o/a; accommodates tube base 1⅜" diam; w/holding spurs	Clamps base of V-112	TGS Type 926C BIR Type 926C AAEP-150F1-23D ⑫	ARC-11096 SZE-354-A-5007
H-181		CLAMP: same as H-180	Clamps base of V-113		
H-182		RIVET, tubular ⅛" lg x 0.062" diam body, 0.125" wd hd; 0.055" d tubular portion	Attach O-138	TJL No. S-722	ARC-234(⅛) SZE-354-A-6026
H-182⊙		WASHER: lock, #6 external teeth, phosphor bronze, nickel plate	10 used	Commercial	Commercial
H-183		RIVET, tubular: ⅛" lg x 0.125" diam body; 0.125" wd hd; 0.055" d tubular portion	Attach resistor clips	TJL No. S-590	ARC-238(⅛) SZE-354-A-6030
H-183⊙	6L50112-2	WASHER: flat #6 brass, nickel pl	8 used	Commercial	Commercial
H-184		SCREW, drive: RH brass, cad pl; ⅛" lg	Attach knob to dial of E-152	Commercial	ARC-8227 SKE-354-A-6075
H-185		PIN, grooved: 18-8SS; 11/32" lg x 0.068" diam one end; 0.0625" diam other end	For E-151	GVP Type 1	ARC-214(11/32) SZE-354-A-6078
H-185⊙	6L3106-32.5	NUT, hexagon #6-32 NC-2 brass, nickel pl	16 used	Commercial	Commercial
H-186		SCREW, set: spline drive; steel; #6-32; ¼" lg; cup point	For E-151	Commercial	ARC-8526 SZE-354-A-6138
H-186⊙ ⑫	4T103643 R5975-093-7473-D446	BUMPER: rubber; cylindrical, 1" OD w/⅜" diam recess ¼" d, fabric back, 0.150" diam mtg hole	Support for dust cover	ATI #253 CAF-970 ⑫	NEEN-949-3333

H-187⊙		PAD: brass, nickel pl, 1⅛" lg x ⅜" wd x ⅛" thk; rounded ends w/two #4-40 tapped holes ¾" C to C and one #10-32 NF-2 center hole p/o Dust Cover A-102	Mtg front panel to Dust Cover	NEEN-949-3339	NEEN-949-3339
H-188⊙ to H-205⊙ incl.		Commercial hardware			
H-206⊙ ●	3F3908-27	SPACER: tubular aluminum; 5/16" OD x 11/32" lg, tapped 4-40 NC-2 axially through entire length	For mounting C-118 & C-123	NEEN-949-3430 TRAA-A-0161-04045	NEEN-949-3430 TRAA-A-0161-04045
H-207⊙ ●	2Z8802-109	SPACER: stud type; SS type 303, hexagonal, 1-11/32" lg x 5/16" wd o/a; w/#8-32 NC-2 male thd for 13/32" lg one end and #6-32 NC-2 female thd in ⅝" d tapped hole other end	For mtg. C-120 and C-121	NEEN-949-3414 TRAA-A-0161-04333	NEEN-949-3414 TRAA-A-0161-04333
H-208⊙	2Z8807-108	SPACER: tubular aluminum; 5/16" OD x ¾" lg, tapped 6-32 NC-2 axially entire length	For mounting C-117	NEEN-949-3466	NEEN-949-3466
H-208●		SPACER: tubular aluminum; ¼" OD x ⅞" lg, tapped 6-32 NC-2 axial entire length	For mounting C-133	TRAA-A-0161-04039	TRAA-A-0161-04039
H-209⊙ to H-219⊙ incl.		Commercial hardware			
H-220⊙ ●		BRACKET: aluminum stock 0.062" thk x ⅜" wd formed U-shaped to 2½" lg x 9/16" h with 7/16" ears; 0.150" hole in each ear, 3⅜" lg o/a	For mounting C-120 and C-121	NEEN-949-3413 TRAA-A-0161-04038	NEEN-949-3413 TRAA-A-0161-04038
H-221⊙ ●		BRACKET ASSEMBLY: aluminum bracket, diamond shaped, w/cylindrical #4-40 nuts in opposite corners of long axis and 0.157" diam holes in opposite corners of short axis; 0.410" diam center hole	For mounting R-145	NEEN-949-3418 TRAA-A-0161-04095	NEEN-949-3418 TRAA-A-0161-04095
H-222⊙ ●		BRACKET ASSEMBLY: p/o O-121		NEEN-949-3396 TRAA-A-0161-04083	NEEN-949-3396 TRAA-A-0161-04083
H-223⊙		HANDLE: aluminum rod, ⅜" diam formed U-shape to 9⅞" lg x 1⅝" wd each end tapped #10-32 NC for ⅝" d full thd, dull black enameled	For lifting Unit	NEEN-949-3411	NEEN-949-3411
H-224⊙	2Z6195.39	LOCK: aluminum key; 1⅞" lg x 11/16" wd x 0.0907" thk o/a; one end tapered to 19/32" wd, 0.502" diam hole in wide end and 3/32" axial slot in narrow end; ⅜" wide notch tapered to ¼" wd x ⅛" d in one side of narrow end. See O-137	For dial locks	NEEN-949-3415	NEEN-949-3415
H-225⊙ ●	7CNE-NE949-3423 R16NEEN-NE949-3423 6625-512-9930 N6625-512-9930	SHAFT: lock assembly; SS type 303, 15/32" lg x ⅜" diam max for 1/32" reduced to 5/16" diam for 5/64" reduced to 0.167" diam measured from a center offset by 0.031" from axis for 11/32"; this portion undercut to 0.175" diam for 5/32" beginning 1/32" in from end w/pin perpendicular to 5/16" diam. See O-140	For dial locks	NEEN-949-3423 TRAA-A-0161-04302	NEEN-949-3423 TRAA-A-0161-04302

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CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
H-226⑧ to H-229⑧		Commercial hardware			
H-230⑧ ⑫	2Z5042-193	CLAMP ASSEMBLY: aluminum plate 1½" lg x ¾" wd x 1/16" thk w/phosphor bronze U-shaped clamp with 15/16" opening between jaws	Mounts R-161	NEEN-949-3565 TRAA-A-0161-04078	NEEN-949-3565 TRAA-A-0161-04078
H-231⑧	6Z4886	GROMMET: synthetic rubber ⅜" OD x ¼" ID x 3/16" thk for 1/16" panel	15 used	ATI#97	
H-232⑧ to H-234⑧		Commercial hardware			
H-235⑧ ⑫	3F30980-5	COLLAR ASSEMBLY: SS type 303; 9/16" diam max x 19/64" lg; 0.255" diam center hole; 0.094" wd recess 0.031" back of face; diam reduced to 0.498" for rest of length; one #6-32 tapped hole for set screw; center hole enlarged to 11/32" diam x 1/64" deep at small end	For R-121	NEEN-949-3416 TRAA-A-0161-04089	NEEN-949-3416 TRAA-A-0161-04089
H-236⑧		Commercial hardware			
H-237⑧		Commercial hardware			
H-238⑪		COLLAR ASSEMBLY: same as H235			
H-239⑧ to H-242⑧		Commercial hardware			
H-243⑧	6L73492	WASHER: spring; round, beryllium copper, nickel pl; 0.219" OD x 0.104" ID x 0.0126" thk; curved on 7/32" radius	2 used	MODE-A-5114	MODE-A-5114
H-244⑧ ⑬	6L57064	WASHER: flat round, nickel silver 7/16" OD x 0.250" ID x 0.008" thk	For O-121	NEEN-949-2304 TRAA-A-0161-04088	NEEN-949-2304 TRAA-A-0161-04088
H-245⑧ ⑪	6L3496	WASHER: spring; round, spring temper nickel silver; 7/16" OD x 0.193" ID x 0.005" thk, curved to 1/16" h o/a	For dial locks	NEEN-949-2444 TRAA-A-0161-04111	NEEN-949-2444 TRAA-A-0161-04111
H-246⑧	2Z8202.21	NUT, lock: hexagonal; one slotted ⅜-32 NEF female portion w/⅜-32 NEF male check nut; 25/32" OD ½" h o/a	4 used	MLL No. 10061	NEEN-12438
H-247⑧	R17B40485-52 3Z1409-679	BUSHING: chassis; brass nickel pl; ½" hexagonal base w/¼" lg x ⅜-32 NEF-2 stud; 0.252" diam hole throughout lg	For R-188	PRME No. 14-C	NEEN-12473
H-248⑧ ⑫	6L50106-10	WASHER: flat; round, ⅝" OD x 0.380" ID x 1/32" thk; brass, nickel pl	For R-188	NEEN-949-3427-2	NEEN-949-3427-2

H-249Ⓑ Ⓗ	R16JAN-CP06SA2 2Z1239.165 N5910-160-4919	BRACKET: capacitor mounting; aluminum 1-11/16" lg x 49/64" wd x 1⅛" h, mtg two 6-32 spade lugs, 1-9/16" C to C	For C-132	CP06SA2	JAN-C-25
H-250Ⓑ Ⓗ	R16JAN-CJ06SA1 N5910-236-2618 5975-236-2618	BRACKET: capacitor mounting; aluminum 1-1/16" lg x 49/64" wd x 1-1/16" h, mtg two 6-32 spade lugs, 1-9/16" C to C	For C-117	CP06SA1	JAN-C-25
H-251Ⓑ		SPACER: aluminum tubing; 3/16" OD x 0.0995" ID x 3/16" lg	For C-122	NEEN-12468	NEEN-12468
H-252Ⓑ	6L3108-32-9.1	NUT: hexagonal, #⅜-32 NEF-2, brass nickel pl	For R-110, R-118, R-130	NEEN-12462	NEEN-12462
I-101	8800-444163 G17-L-6297 N17-S-74139-4794 8870-938000-375 2Z5952	LAMP, incandescent: 6-8 v, 0.15 amp; bulb T3¼ clear; 1-3/16" lg max o/a; miniature bayonet base; tungsten filament; burn any position	Indicator, space heaters	GE Type 47	ARC-11349 SZE-354-A-5033 TC-860A0016
I-102		LAMP, incandescent: same as I-101	Indicator, 115v input		
I-103		Refer to "Accessories" parts list			
I-104		Refer to "Accessories" parts list			
I-105		Refer to "Accessories" parts list			
I-106	N17-L-76737-2771	DIAL: p/o E-151; black alumilite; reversed etched; dull black background; scale divisions 1-100; 2" diam x 0.187" thk. Not replaceable in Ⓑ	Signal frequency dial	ARC-14942 SZE-354-A-6077 TRAA-A-0161-04093	ARC-14942 SZE-354-A-6077 TRAA-A-0161-04093
J-101	3300-299835297 R5935-187-5225-E222 N5935-636-8293 8850-654218 2Z7390-290	CONNECTOR, receptacle: one round female contact; straight; 0.437" OD x 1-1/16" lg #3-56 NF-2 thd mtg holes on 0.500" mtg/c in four corners of 0.090" thk x 11/16" sq mtg flange	Sync input voltage	UG-290/U	BuShips Dwg Re49F331
J-102		CONNECTOR, receptacle: same as J-101	Undelayed sync output		
J-103		CONNECTOR, receptacle: same as J-101	Delayed sync output		
J-104		CONNECTOR, receptacle: same as J-101	External modulation input		
J-105	3300-287350476 R16-R-2435-1 N5935-201-5983 8850-654440 2Z3062-167	CONNECTOR, receptacle; one round female contact; straight; 1-1/32" lg x ¾" w x ¾" h; part of cable assembly W-105	R-f output	UG-291/U	BuShips Swg Re49F246

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TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
J-106	4248-4891 R17-R-2029-20	CONNECTOR, receptacle: two flat parallel blades; straight; 2-7/32" lg x 1⅝" w x 1¼" h o/a; 10 amp, 250 v or 15 amp, 125 v; cylindrical brass body with flange, nickel pl; molded black composition insert; two 0.156" diam mtg holes in flange on 1-15/16" mtg/c; flush mtg	115-volt input	HAW RC-11834	ARC-14714 SZE-354-A-5003
J-106Ⓡ	8850-215400 N17-C-73448-7320	CONNECTOR, receptacle: two flat parallel blades; straight; 2.312" lg approx 1-11/16" w x 1¼" h o/a; 10 amp, 250 v or 15 amp, 125 v, cylindrical brass body w/flange, nickel pl; molded black composition insert; two 0.156" diam mtg holes in flange on 1-15/16" mtg ctr; flush mtg	115-volt input	HUB-4891	TC-804A0088
J-106Ⓥ	8850-494060 6Z3150A-19	CONNECTOR, receptacle; two flat parallel blades; straight; 10 amp, 250 v, or 15 amp, 125 v; cylindrical brass body w/flange, nickel pl, molded black composition insert; two 0.156" diam mtg holes in flange on 1-15/16" mtg/c; flush mtg. 2-7/16" lg x 1¾" w x 1¼" h o/a	115-volt input	BRY Type UR	NEEN-12426
J-106🅝	N5935-189-2962 5935-189-2962	CONNECTOR, receptacle: 3 round pins; straight type; 1" lg x 1" w x 29/32" h o/a; flange type for panel mtg; mounts by four 0.120" dia holes on 23/32" x 23/32" mtg centers	Receives 115-volt input power	AN3102A-10SL-3P	MIL-C-5015B
L-101	3300-310200752 R16-R-1652 N16-R-29121-9821	REACTOR: filter choke; 6 hy, 0.125 amp; 105 to 140 ohms DC resistance; 1500 volts RMS 60 cyc test, hermetically sealed metal case; 2" lg x 1⅞" w x 2¾" h, excluding term; four #4-40 NC-2 inserts, two located on each long side of case 0.354" from cover end on 1½" mtg/c; two stud-type term on cover on 1¼" ctr; synthetic resin base varnish impregnated, "Ozite" wax filled	Power supply filter choke	ARC-13965 SZE-354-C-3002 TC-300B0001	ARC-13965 SZE-354-C-3002 TC-300B0001
L-101Ⓥ 🅟	3340-062454950 3C557Z30 R5950-578-8389-E222 N5950-557-6847	REACTOR: filter choke; same as L-101 except 2" lg x 1-15/16" w x 2¾" h excluding term; four mtg ears on 1½" mtg/c; two solder type term on bottom on 1-3/16" center	Power supply filter choke	SLE No. 20444 TRAA-B-0161-04336	NEEN-12439 TRAA-B-0161-04336
L-102	R5999-608-6246-E212 N5950-578-8000 3340-060701350 3C1084Z112	COIL, RF: choke; universal wound; 10.9 mh ±5% at 1000 cyc; approx 1000 turns #38 single silk enameled copper; unshielded; 0.736" diam max x 1⅛" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1¼" lg; bakelite varnish impregnated	Peaking, V-104	ARC-14529 SZE-354-A-5029 NEEN-12425-1 TRAA-A-0161-04042	ARC-14529 SZE-354-A-5029 NEEN-12425-1 TRAA-A-0161-04042
L-102Ⓢ	3340-0607021790 N16-C-75157-7001	COIL, RF: choke; universal wound; 10.9 mh ±5% at 1000 cyc; approx 1000 turns #38 single silk enameled copper; unshielded; 0.836" diam max x 1⅜" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1½" lg; bakelite varnish impregnated	Peaking, V-104	TC-320A0008	TC-320A0008

L-103	R9999-608-6247-E212 N5950-578-8006 3340-060719290 3C1084Z117-2	COIL, RF: choke; universal wound; 0.205 mh ±5% at 1000 cyc; approx 150 turns #38 single silk enameled copper; unshielded; 0.442" diam max x 1⅛" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1¼" lg; bakelite varnish impregnated	Peaking, grid V-107	ARC-14527 SZE-354-A-5030 NEEN-12425-2 TRAA-A-0161-04043	ARC-14527 SZE-354-A-5030 NEEN-12425-2 TRAA-A-0161-04043
L-103Ⓑ	3340-060700980 N16-C-75655-3251	COIL, RF: choke; universal wound; 0.205 mh ±5% at 1000 cyc; approx 150 turns #38 single silk enameled copper; unshielded; 0.442" diam max x 1⅜" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1¼" lg; bakelite varnish impregnated	Peaking, V-107	TC-320A0009	TC-320A0009
L-104	R9999-608-6248-E212 N5950-578-1999 3340-060719300 3C1084Z-112-1	COIL, RF: choke; universal wound; 0.843 mh ±5% at 1000 cyc; approx 300 turns #38 single silk enameled copper; unshielded; 0.494" diam max x 1⅛" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1¼" lg; bakelite varnish impregnated	Peaking, plate V-107	ARC-14528 SZE-354-A-5031 NEEN-12425-3 TRAA-A-0161-04044	ARC-14528 SZE-354-A-5031 NEEN-12425-3 TRAA-A-0161-04044
L-104Ⓑ	3340-060701590 N16-C-74270-6240	COIL, RF: choke; universal wound; 0.843 mh ±5% at 1000 cyc; approx 300 turns #38 single silk enameled copper; unshielded; 0.494" diam max x 1⅜" lg o/a; three strands for coil leads, one #22 tinned copper term lead 1½" lg; bakelite varnish impregnated	Peaking, plate V-107	TC-320A0010	TC-320A0010
L-105	†	COIL: pickup loop; part of O-106	Thermistor pickup loop	ARC-13707 SZE-354-A-6348 TRAA-A-0161-04171	ARC-13707 SZE-354-A-6348 TRAA-A-0161-04171
L-106ⒹⒸ	3340-307818559 N5950-578-1060 R16C22051 3C303-186	COIL, RF: choke; single winding, single layer wound; 0.25 microhenries approx; 13 turns #28 enameled wire; unshielded; 5/32" OD x ⅜" lg w/two axial wire term, each 1½" lg; resin bonded core 0.127" diam x 5/16" lg	Filter, grid V-111	JFE Type Red Dot CFI ⅜-13/28	ARC-14140 SZE-354-A-6280 TC-321A0001 MODE-A-3000D TRAA-A-0161-04259
L-107ⒹⒸ		COIL, RF: same as L-106	Filter, cathode V-111		
L-108ⒹⒸ		COIL, RF: same as L-106	Filter, heater V-111		
M-101	3300-326460001 R16-M-2123 R16WS-PS64089 N17-M-22753-9432	METER, microammeter: special db scale; DC, RF; calibrated −6 +3 db; round steel flush mtg case; 2.170" diam barrel, 1.370" d behind flange, excluding term, 2.695" diam flange; ±2% accuracy; 200 micro-amp required for full scale deflection; 75 ohms ±5%; 14 scale divisions, black characters except red line at ZERO SET and at POWER SET, white background; self contained; three mtg holes in flange, ⅛" diam 120 deg apart on 1.220" rad	R-F power indicator	WS Model 1021	ARC-13173 SZE-354-A-5000
M-101Ⓑ	0801-651B0001 N17-M-22753-9421	METER, microammeter: special db scale; DC, RF; calibrated −6 to 1 +3 db; round steel flush mtg case; 2.20 in. max diam barrel 1.6" max d behind flange, excluding term, 2.695" dia flange; ±2% accuracy; 200 microamp required for full scale deflection; 75 ohms 5%; 14 scale division, black characters and scale except red line at ZERO SET and at POWER SET, white background; self contained; three mtg holes in flange ⅛" diam 120 deg apart on 1.2220" rad; two stud term #8-32 NC-2, ¾" max lg spaced 1" c to c; p/o thermistor bridge	R-F power indicator	MAR-HS2 RS-DDHR with 200 micro-amp movement	TC-651B0001

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
M-101Ⓢ	0801NE-12436 R17-M-22753-9425N 3F3303-1.1	METER, microammeter: same as M-101 except 2.172" diam plastic barrel, 1.156" d behind flange excluding term; 2.719" diam flange; two stud term #10-32 NC-2 ¾" lg, spaced 1" c to c	R-F power indicator	MAI Type MR25W with scale per NEEN-12437	NEEN-12436
M-101⓫	N6625-578-5748 6625-669-0760	METER, microammeter: same as M-101Ⓢ except stud term are #8-32	R-F power indicator	TRAA-C-0161-04080	TRAA-C-0161-04080
N-101	3300-291396101 R16-D-3226 N17-S-117101-439 7CAC-271364 N16-S-117101-733 7CM3-ME-B-5131 R16MODE-B5131 5355-512-9643	DIAL: signal frequency dial, cavity tuning, calibrated 900-2100 mc and 0 to 70; p/o cavity assembly A-105; consists of calibrated aluminum dial, face of dial reverse etched with dull black background, scale divisions and character lines bright; spacer; washer; two aluminum backlash minimizing spur gears each 117 teeth, 48 pitch, 2.478" OD, 2.437" PD, assembled on hub; approx 5½" diam x 7/16" thk, 3/16" diam hole through hub, assembly secured on shaft by collar retained by set screw	Signal frequency indicator	ARC-13836 SZE-354-A-6053 TC-765B0001 MODE-B-5131 TRAA-B-0161-04112	ARC-13836 SZE-354-A-6053 TC-765B0001 MODE-B-5131 TRAA-B-0161-04112
N-102	3300-291396102 R16-D-3226-500 N16-S-117101-440 7CAC-271363-5 N16-S-1117101-782 7CM3-ME-B-5132 R16MODE-B5132 5355-507-5640	DIAL: two scale attenuator dial; outer scale, calibrated counterclockwise from −3 to −12 db, inner scale calibrated clockwise 100,000 to 0.2 microvolt, p/o cavity assembly A-105; consists of calibrated aluminum dial, face of dial outside 2.312" rad reverse etched with dull black background, scale divisions and character lines black; spacer; two aluminum backlash minimizing spur gears ea 72 teeth, 48 pitch, 1.538" OD, 1.496" PD, assembled on hub; approx 5½" diam x 7/16" thk, 3/16" diam hole through hub; dial and gear assembly free to rotate on shaft which is passed through 3/16" diam hole in dial hub, assembly secured on shaft by collar retained by set screw	Attenuator indicator	ARC-13837 SZE-354-A-6054 TC-765B0010 MODE-B-5132 TRAA-B-0161-04125	ARC-13837 SZE-354-A-6054 TC-765B0010 MODE-B-5132 TRAA-B-0161-04125
N-104ⓙ		PLATE, identification: aluminum, black anodized finish; 2" lg x ⅝" wd	Equipment identification	TRAA-A-0161-04322	TRAA-A-0161-04322
O-101	R16ARC-13181 N16-S-21006-6675 16-S-21005-5501	SHAFT: worm; 18-8SS; 4.407" lg, 0.187" diam one end, 0.3165" diam other, varying diameters between as follows: 0.187" diam end with 45 deg chamfer x 0.010" for 0.109"; 0.172" diam for 0.156"; 0.187" diam for 0.688"; 0.300" blank diam for 0.531" w/axial 0.187 in. full tooth; 0.3165" diam for 0.110"; spline 12 teeth, 48 pitch at 14½ deg pressure angle, 0.250" PD x 0.290" OD, 1½-32 NS-2 thd, both ends 45 deg chamfer to minor diameter, 2.719" lg, o/a; 0.3165" diam for 0.094" w/45 deg chamfer x 0.010", w/0.062" diam hole through this end w/60 degree centerdrill to 0.125" diam	Drives contacting ring E-101	ARC-13181 SZE-354-A-6281 TC-762A0056 TRAA-A-0161-04212	ARC-13181 SZE-354-A-6281 TC-762A0056 TRAA-A-0161-04212
O-101①	7CM3-ME-C-5211 R16MODE-C5211	SHAFT AND BEARING ASSEMBLY: worm shaft O-101A complete with bearing O-102 lapped in with #300 grinding compound at assembly	Drives contacting ring E-101	MODE-C-5211	MODE-C-5211

O-101AⒷ	2Z8203-703	SHAFT ASSEMBLY: worm; same as O-101 except 4.469" lg o/a and the 0.888" dimension replaced by 0.750" and ½-32 NS-2 thd replaced by ½-32 special ground. Includes Ketos steel bearing race pressed on each end and ground concentric with worm threads		MODE-A-5136	MODE-A-5136
O-102	R6625-608-6237-E222 N16-S-856221-125 N16-P-400861-133	BEARING: hard tobin bronze; 1.469" diam x 0.125" wd, turned to 0.556" diam x 0.500", 0.250" of which is tapered 0.532" diam; ½"-32 NS-2 intergal thd for full lg; tapered end contains 8 axial slots 0.020" wd, 45° apart; on a 0.484" rad from ctr 6 holes 60° apart of 0.069" diam; on a 0.609" rad from ctr 3 holes 0.194" diam csk 90 deg to 0.219" diam on both sides, 120° apart; on a 0.609" rad from ctr 6 holes 60 deg apart tapped #2-56 NC-2; on 0.609" rad from ctr 3 holes 120 deg apart tapped #2-56 NC-2; on 0.609" rad from ctr 3 holes 120 deg apart of 0.156" diam	Worm bearing for E-101	ARC-13106 SZE-354-A-6282 TC-762A0055 TRAA-A-0161-04337	ARC-13106 SZE-354-A-6282 TC-762A0055 TRAA-A-0161-04337
O-102Ⓑ	3F1776A-2.	BEARING: phosphor bronze; 1.469" diam x 0.125" wd, turned to 0.590" diam x 0.500", 0.250" of which is tapered to 0.556" diam; ½-32 internal thd, PD of 0.4797-0.4815, for full length; tapered end contains 8 axial slots 0.020" wd, 45 deg apart, on a 0.483" rad from ctr 6 holes 60 deg apart of 0.069" diam; on a 0.609" rad from ctr 3 contact fingers, 120 deg apart; on a 0.609" rad from ctr 6 holes 60 deg apart w/contact fingers; on 0.609" rad from ctr 3 holes 120 deg apart of 0.159" diam	Worm bearing for E-101	MODE-B-5203	MODE-A-5203
O-103	N16-R-673641-112* Shop manufacture†† 2Z7259-235	ROD, spacing: 18-8SS; 0.1875" diam x 3.109" lg, o/a; one end tapped w/4-40 NC-2 full thd, 5/16" d; other end 6-32 NC-2 external thd, 0.109" lg w/undercut 0.031" to root diam	Connects O-129 to O-104	ARC-13269 SZE-354-A-6244 TC-762A0054 MODE-A-5083A TRAA-A-0161-04311	ARC-13269 SZE-354-A-6244 TC-762A0054 MODE-A-5083A TRAA-A-0161-04311
O-104	N16-R-500371-198* Shop manufacture†† R16MODE-B5107F	BEARING: cavity block; half hard brass, nickel pl; 1.498" diam x 1.000" wd; on one end on 0.609" rad, 3 holes 120 deg apart tapped #6-32 NC-2 full thd, 3/16" d; 3 holes 120 deg apart 0.205" diam csk 90 deg to —0.234" diam both ends; from this end at a disance 0.109" from edge 0.500" diam hole; from other end w/center line at 0.156" from edge 3 holes 120 deg apart 0.111" diam counterbored to 3/16" diam x 0.172" d	Supports bearing for worm O-101 and supports Y-101	ARC-13271 SZE-354-B-6283 TC-762B0049 MODE-B-5107F TRAA-B-0161-04297	ARC-13271 SZE-354-B-6283 TC-762B0049 MODE-B-5107F TRAA-B-0161-04297
O-105	†	MOUNTING: foot; part of Y-102	Cavity mounting foot	TRAA-A-0161-04282	TRAA-A-0161-04282
O-106	R16-H-6815 3300-298362075 N5820-604-0732 R16MODE-A7027 3H3900.24	MOUNTING, thermal resistor: thermistor mtg; slides into shell of attenuator assembly A-107, retained by pressure of choke Z-105, mtd on attenuator assembly A-107 by thumb nut H-108; p/o cavity assembly A-105; consists of sleeve, contacting ring, and loop assembly; approx ⅝" diam x 1-7/16" lg, o/a	Mounting for thermistor TH-103	ARC-13826 SZE-354-A-6284 TC-761A0011 MODE-A-7027 TRAA-A-0161-04173	ARC-13826 SZE-354-A-6280 TC-761A0011 MODE-A-7027 TRAA-A-0161-04173

*Not furnished as a maintenance part for BuShips activities personnel. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
O-107	6625-313-7438	ASSEMBLY, tube: consists of half hard brass tubing; 5.391" lg, 0.495" diam one end, other end 0.436" diam x 0.266" lg; on larger diameter end 0.094" to center line 3 holes 120 deg apart, 0.106" diam; 0.4375" ID for 0.375" lg from larger diameter followed by 0.386" ID for remainder; smaller diam end chamfered 45 deg x 0.016"; and half hard brass support approx 1.156" lg w/⅜" rad extended end, 0.250" thk x 0.750" wd; 0.4375" diam hole in rad end w/center line 1.156" from opposite end; tapped other end on wd #3-48 NC-1¼" d; p/o attenuator cable assembly	Attenuator piston	ARC-13735 SZE-354-A-6321 TRAA-A-0161-04177	ARC-13735 SZE-354-A-6321 TRAA-A-0161-04177
O-107®	R16MODE-B7065 3E7350-2.23	CABLE AND PISTON ASSEMBLY: final with attenuator piston; half hard brass tube and support assembly, 6.516" lg x 1.531" h x 0.750" wd; silver pl; w/attached RG-55/U cable approx 24" lg assembled through bushing assembly to UG-291/U connector at one end and through spacer, sleeve, clamp, and insulating spacer to pickup loop and 51 ohm resistor at other end; this end secured in tube and support assembly	Attenuator piston and output cable	MODE-B-7065	MODE-B-7065
O-108	R6625-608-6230-E222 N5820-604-0733 7CM3-ME-A-5035 R16MODE-A-5035 6625-203-1457	GEAR: rack type gear; brass, nickel pl; straight teeth, 14½ deg pressure angle, generated involute system; 48 pitch; 3½" lg x ¼" wd x ⅛" thk; straight face; one mtg hole 0.190" diam to root of teeth, 0.104" diam through hole csk at 82 deg on tooth side to 0.190" diam; p/o attenuator cable assembly W-105	Attenuator rack	ARC-13170 SZE-354-A-6236 TC-768A0006 MODE-A-5035 TRAA-A-0161-04213	ARC-13170 SZE-354-A-6236 TC-768A0006 MODE-A-5035 TRAA-A-0161-04213
O-109	3300-298345317 R16-G-2703 N16-G-431536-656* 7CM3-ME-A-5049 R16MODE-A5049 6625-203-1571	GEAR: spur type; brass, nickel pl; straight teeth; 32 teeth; 48 pitch, 0.667" PD; 0.709" OD x 0.1875" diam bore x 0.438" lg o/a; tooth face 0.219" lg, 0.437" diam hub, 0.219" lg; straight face; mtd on shaft by two #6-32 NC-2 set screws; p/o attenuator assembly A-107	Attenuator rack driving gear	ARC-13334 SZE-354-A-6240 TC-767A0002 MODE-A-5049 TRAA-A-0161-04211	ARC-13334 SZE-354-A-6240 TC-767A0002 MODE-A-5049 TRAA-A-0161-04211
O-110	N16-S-20894-7555* 2Z3273-288	SHAFT: coupling; 18-8SS; 1.281" lg x 0.437" diam one end, other end 0.187" diam; 0.437" diam end for 0.500" lg, chamfered 45 deg x 0.020", drilled through w/0.1875" diam hole, 0.391" d, tapped on rad #6-32 NC-1 two holes 90 deg apart centered 0.187" from end; followed by 0.187" diam for 0.563"; followed by 0.172" diam for 0.156"; and 0.187" diam for 0.062" with 45 deg x 0.020" chamfer	Connects shaft O-111 to gear O-109	ARC-13335 SZE-354-A-6285 TC-767A0003 MODE-A-5050 TRAA-A-0161-04237	ARC-13335 SZE-354-A-6285 TC-767A0003 MODE-A-5050 TRAA-A-0161-04237

O-111	N16-S-21020-5401* 16-S-21020-5501 Shop manufacture†† 2Z8203-704	SHAFT: attenuator; half hard brass, nickel pl; 5.687" lg x 0.250" diam max; 0.187" diam one end w/45 deg x 0.020" chamfer for 0.078" lg; 0.172" diam for 0.156" lg; 0.187" diam for 1.016" lg; 0.250" diam for 4.062" lg; 0.187" diam for 0.110" lg; 0.172" diam for 0.156" lg; 0.187" diam for 0.109" lg chamfered 45 deg x 0.020" at end	Attenuator drive shaft; connects gears O-116 to shaft O-110	ARC-13631 SZE-354-A-6102 TC-761A0027 MODE-A-5116 TRAA-A-0161-04135	ARC-13631 SZE-354-A-6102 TC-761A0027 MODE-A-5116 TRAA-A-0161-04135
O-112	3300-298300943 N17-C-98431-2144 Shop manufacture††	COUPLING, rigid: sleeve type; consists of half hard brass, nickel pl shaft 0.187" diam max x 2.208" lg o/a, and nickel silver disc 0.064" thk x 0.750" diam w/0.129" hole 0.094" distance from edge; 0.064" wd semi-circle slot at a rad of 0.312" from ctr of disc	Couples shaft of gear sub-assembly O-116 to shaft O-111	ARC-13340 SZE-354-A-6101 TC-761A0031	ARC-13340 SZE-354-A-6101 TC-761A0031
O-112Ⓢ Ⓗ	2Z3273-287	COUPLING, rigid: sleeve type; consists of half hard brass, nickel pl collar ½" diam max x ¾" lg o/a; w/0.189" hole throughout length; chamfered 45° both ends; four #6-32 NC-2 holes thru periphery in pairs 90° apart 0.375" c to c	Couples shaft of gear sub-assemebly O-116 to shaft O-111	MODE-A-5052C TRAA-A-0161-04134	MODE-A-5052C TRAA-A-0161-04134
O-113	3300-298396064 R16-S-3862 N3040-540-7079 Shop manufacture†† R16MODE-A5117 2Z8204-49	SHAFT ASSEMBLY: drive shaft for power setting of cavity output to attenuator; p/o attenuator on cavity assembly A-105; consists of 0.150" diam flexible shafting, a length of flexible transparent plastic tubing, over the shafting, and two end fittings; shaft of phosphor bronze, and fittings of brass, nickel pl; approx 0.219" diam at fittings x 5.062" lg o/a	Powerset shaft	ARC-13750 SZE-354-A-6104 TC-761A0020 MODE-A-5117 TRAA-A-0161-04143	ARC-13750 SZE-354-A-6104 TC-761A0020 MODE-A-5117 TRAA-A-0161-04143
O-114	†	SUB-ASSEMBLY: gear; p/o N-101; consists of two 52SH aluminum gears ea 117 teeth 48 pitch, 2.478" OD x 2.437" PD, 14½" deg pressure angle assembled on hub approx 5½" diam x 7/16" thk	Frequency dial gear		
O-114A	N16-G-433236-686 For reference only†† R6625-608-6238-E212	GEAR: spur type; 52S-H aluminum alloy; 117 teeth; 48 pitch, 14½ deg pressure angle; 2.478" OD x 2.437" PD, 0.4375" diam hub mtg hole (listed for reference only for Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651)	Frequency dial gear together with O-114B	ARC-13195 SZE-354-B-6150 TC-765A0006 MODE-B-5183 TRAA-A-0161-04115	ARC-13195 SZE-354-B-6150 TC-765A0006 MODE-B-5183 TRAA-A-0161-04115
O-114B	N16-G-433236-123 If failure occurs, requisition a replacement part from ESO, referencing NavShip 900,180A as authority†† R6625-608-6239-E212	GEAR: spur type; 52S-H aluminum alloy; 117 teeth, 48 pitch, 14½ deg pressure angle; 2.478" OD x 2.437" PD; 0.3125" diam hub mtg hole; three 0.099" diam holes 120 deg apart counterbored 3/16" diam x 0.016" d on 0.687" rad (listed for reference only for Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651)	Frequency dial gear together with O-114A	ARC-13196 SZE-354-B-6149 TC-765A0007 MODE-B-5184 TRAA-A-0161-04116	ARC-13196 SZE-354-B-6149 TC-765A0007 MODE-B-5184 TRAA-A-0161-04116
O-115	3300-291628293 R16-G-2841 N16-G-500001-435 7CM3-ME-A-5000 R16MODE-A5000 2Z4875-492	SUB-ASSEMBLY: gear, p/o cavity assembly A-105; consists of two 52S-H aluminum backlash minimizing gears each of 126 teeth 48 pitch, 2.667" OD x 2.625" PD, assembled with tension spring on hub H-120; 2.667" OD x ¾" thk o/a; ⅜" diam x 5/16" d hole in hub for mtg on shaft, secured to shaft by two #6-32 set screws	Drive gear for R-185	ARC-13684 SZE-354-A-6050 TC-764A0010 MODE-A-5000 TRAA-A-0161-04203	ARC-13684 SZE-354-A-6050 TC-764A0010 MODE-A-5000 TRAA-A-0161-04203
O-115AⒽ	R6625-608-6241-E212	GEAR, free: p/o O-115		TRAA-A-0161-04204	TRAA-A-0161-04204
O-115BⒽ	R6625-608-6242-E212	Gear, driven: p/o O-115		TRAA-A-0161-04205	TRAA-A-0161-04205

*Not furnished as a maintenance part for BuShips activities personnel. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

CONTRACTS. See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
O-116	3300-291628295 R16-G-2842 N16-G-500001-434 7CM3-ME-B-5128 R16MODE-B5128 6625-512-9629	SUB-ASSEMBLY: gear; p/o attenuator assembly A-107, on cavity assembly A-105; consists of two aluminum 52S-H backlash minimizing spur gears ea 120 teeth 48 pitch, 2.541" OD x 2.500" PD, a hub gear of 60 teeth 48 pitch, 1.292" OD x 1.250" PD, assembled on a hub; 2.541" OD x 1-9/16" lg o/a; portion of hub forms shaft 3/16" diam x 1¼" lg	Attenuator drive intermediate gears	ARC-13661 SZE-354-A-6051 TC-764A0001 MODE-B-5128 TRAA-A-0161-04207	ARC-13661 SZE-354-A-6051 TC-764A0001 MODE-B-5128 TRAA-A-0161-04207
O-116A ⓭	R6625-608-6243-E212	GEAR, free: spur type; aluminum alloy; 120 teeth; 48 pitch; 14½ deg pressure angle; 2.5 PD; ⅜" diam mtg hole	Part of O-116	TRAA-A-0161-04208	TRAA-A-0161-04208
O-116B ⓭		GEAR, fixed: same as O-116A except for ¼" diam mtg hole	Part of O-116	TRAA-A-0161-04209-2	TRAA-A-0161-04209-2
O-116C ⓭	R6625-608-6626-E212	GEAR, attenuator drive: spur type; aluminum alloy; 60 teeth; 48 pitch; 14½ deg pressure angle; 1.25 PD; ¼" diam mtg hole	Part of O-116	TRAA-A-0161-04210	TRAA-A-0161-04210
O-117		SUB-ASSEMBLY: gear; p/o N-102; consists of two 52 S-H aluminum alloy gears O-117A and O-117B ea 72 teeth 48 pitch, 1.538" OD x 1.496" PD; assembled on hub approx 5½" diam x 7/16"	Attenuator dial gear		
O-117A	N16G-432335-865 If failure occurs requisition a replacement part from ESO, referencing NavShips 900,180A as authority†† R6625-608-6224-E212	GEAR: spur type; 52S-¼-H aluminum alloy; 72 teeth, 48 pitch, 14½ deg pressure angle; 1.538" OD x 1.496" PD; 0.4375" diam hub mtg hole (listed for reference only for Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651)	Attenuator dial gear together with O-117B	ARC-10879 SZE-354-B-6152 TC-765A0018 TRAA-A-0161-04129	ARC-10879 SZE-354-B-6152 TC-765A0018 TRAA-A-0161-04129
O-117B	N16-G-432335-815 If failure occurs requisition a replacement from ESO, referencing NavShips 900,180A as authority†† R6625-608-6225-E212	GEAR: spur type; 52S-H aluminum alloy; 72 teeth, 48 pitch, 14½ deg pressure angle; 1.538" OD x 1.496" PD; 0.3125" diam mtg hole; three 0.067" diam holes 120 deg apart counterbored ⅛" diam x 0.014" d on 0.359" rad (listed for reference only for Contract No. N383s-60879, N383s-61060, N383s-75748 and N383s-77651)	Attenuator dial gear together with O-117A	ARC-13189 SZE-354-B-6151 TC-765A0016 MODE-B-5182 TRAA-A-0161-04130	ARC-13189 SZE-354-B-6151 TC-765A0016 MODE-B-5182 TRAA-A-0161-04130
O-118	R16ARC-13211 3300-295558737 N5820-604-0730 16-G-431136-108 Shop manufacture†† 2Z8202-26	SHAFT: attenuator drive; p/o cavity assembly A-105; consists of shaft 0.187" diam x 2.359" lg, 60 deg ctr drilled on one end to 0.094" diam and having a straight spur gear of 12 teeth, 48 pitch, 0.292" OD, 0.250" PD, and 0.203" lg face cut 0.953" from solid end of shaft, shaft has two 0.156" reductions to 0.172 in. diam located 0.109" from solid end and 0.078" from drilled end and an undercut 0.047" wd to 0.180" diam adjacent each side of gear teeth; 18-8SS; 0.292" diam x 2-23/64" lg	Attenuator drive shaft	ARC-13211 SZE-354-B-6055 TC-761B0023 MODE-B-5133 TRAA-B-0161-04133	ARC-13211 SZE-354-B-6055 TC-761B0023 MODE-B-5133 TRAA-B-0161-04133

O-119	3300-291628294 R16-G-2754-8 16-G-500001-433 7CM3-ME-B-5130 R16MODE-B5130 6625-399-7330	SUB-ASSEMBLY: gear p/o cavity assembly A-105; consists of two 52S-H aluminum backlash minimizing spur gears each of 120 teeth 48 pitch; 2.541" OD x 2.500" PD, a hub gear of 15 teeth 48 pitch, 0.353" OD x 0.312" PD, assembled on a hub; 2.541" OD x 9/16" thk o/a; portion of hub forms shaft 1/4" diam x 3/16" lg	Frequency drive intermediate gears	ARC-13830 SZE-354-A-6052 TC-764A0005 MODE-B-5130 TRAA-A-0161-04200	ARC-13830 SZE-354-A-6052 TC-764A0005 MODE-B-5130 TRAA-A-0161-04200
O-119A 🅗		GEAR, free: same as O-116A; p/o O-119			
O-119B 🅗	R6625-608-6222-E212	GEAR, fixed: same as O-116B except for counter-bore; p/o O-119		TRAA-A-0161-04209-1	TRAA-A-0161-04209-1
O-120		Not used			
O-120Ⓑ 🅗	3Z7651	SHAFT: brass nickel pl, 2-13/16" lg x 1/2" diam o/a; 0.50" diam for 0.50", 0.235" diam for 1.844", 0.219" diam for 0.125", 0.235" diam for rest of lg. 0.265" diam hole 3/8" d on large end. Two tapped 6-32 NC-2 radial holes 90° apart on 0.50" diam	Extension shaft for S-101	NEEN-949-3424 TRAA-A-0161-04328	NEEN-949-3424 TRAA-A-0161-04328
O-121		Not used			
O-121Ⓑ 🅗	3F2624BA	COUPLING BRACKET ASSEMBLY: 1½" wd x 1⅜" h x 1¾" lg o/a; consists of bracket assembly H-222, coupling assembly O-122, collar H-235, and washer H-244	Mounting for power set drive shaft	NEEN-949-3695 TRAA-A-0161-04082	NEEN-949-3695 TRAA-A-0161-04082
O-122		Not used			
O-122Ⓑ 🅗	3F2624A-1	COUPLING ASSEMBLY: p/o O-121 SS type 303, shaft 1¾" lg x 7/16" diam o/a; 7/16" diam for ½" reduced to 0.245" diam for rest of lg. This portion flatted to 7/32" for 11/16" from end. Two 6-32 NC-2 radial holes 90° apart in 7/16" diam portion; 0.189" diam hole in large end	Shaft for O-121	NEEN-949-3417 TRAA-A-0161-04087	NEEN-949-3417 TRAA-A-0161-04087
O-123	3300-295558868 R16-S-3866-500 16-S-21226-1222	COUPLING, rigid: shaft insulating and extending type; 0.251" diam shaft opening on one end; 0.248" diam extension shaft on other end; mtd w/single set screw; 1⅛" lg x 0.437" diam o/a; consists of cadmium pl brass collar, ceramic shaft and nickel pl brass extension shaft	Insulates shaft of R-188	ARC-13644 SZE-354-A-6097	ARC-13644 SZE-354-A-6097
O-123Ⓑ 🅗	16-S-21226-1222 N5820-604-0727	COUPLING, rigid: shaft insulating and extending type; 0.251" diam shaft opening on one end; 0.251" diam extension shaft on other end; mtd w/two set screws; 1-9/16" lg x 0.500" diam o/a; consists of cadmium pl brass collar, slotted bakelite shaft	Insulates shaft of R-188	TC-760A0009 TRAA-A-0161-04036	TC-760A0009 TRAA-A-0161-04036
O-123Ⓑ	3GK1087-3	SLEEVE, insulating; black vinyl 1-11/32" lg x 9/16" diam o/a	Insulator for Z-105	MODE-A-4023	MODE-A-4023
O-124	3300-664550010 R5840-093-8170-D334 N17-C-945001-631 17C-49523-2672	SLEEVE, insulating; molded rubber, no dimensions of this item greater than 1¼ inch	Insulator for Z-101	ARC-13835 SZE-354-A-6090 TC-848A0002 MUE-87🅗	ARC-13835 SZE-354-A-6090 TC-848A0002
O-124Ⓑ		SLEEVE, insulating: same as O-123Ⓑ	Insulator for Z-101		
O-125		SLEEVE, insulating: same as O-124	Insulator for Z-102		
O-125Ⓑ		SLEEVE, insulating: same as O-123Ⓑ	Insulator for Z-102		
O-126		SLEEVE, insulating: same as O-124	Insulator for Z-103		
O-126Ⓑ		SLEEVE, insulating: same as O-123Ⓑ	Insulator for Z-103		
O-127		SLEEVE, insulating: same as O-124	Insulator for Z-104		
O-127Ⓑ		SLEEVE, insulating: same as O-123Ⓑ	Insulator for Z-104		

CONTRACTS. See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
O-128	R16-C-38195 16-C-650001-675 Shop manufacture†† R16NEEN-NE949-1649 2Z3351-474	COVER: switch; aluminum, potash dipped; approx 3¾" lg x 2⅜" wd x 1-13/16" h; three 0.141" diam mtg holes, two on one end ⅛" from open side on 1¼" centers, one on center of opposite end of cover ⅛" from open side	Protects S-101	ARC-13636 SZE-354-B-6037 TC-756A0012 NEEN-949-1649 TRAA-A-0161-04047	ARC-13636 SZE-354-B-6037 TC-756A0012 NEEN-949-1649 TRAA-A-0161-04047
O-129	N16-P-402301-125 Shop manufacture†† R6625-608-8969-E222	PLATE: end; half hard brass, nickel pl; 1.498" diam x 0.203" thk; tapped through periphery at a center line of 0.101" three holes 120 deg apart #3-48 NC-2 to 3/16" d min; drilled and tapped through surface ⅜" -48 NS-2; 3 surface holes on 0.609" rad from ctr 0.116" diam, 120 deg apart, csk 82 deg ¼" diam; 3 tapped surface holes 120 deg apart #6-32 NC-2	End plate for worm bearing	ARC-13272 SZE-354-B-6286 TC-762A0050 MODE-A-5040B TRAA-A-0161-04312	ARC-13272 SZE-354-B-6286 TC-762A0050 MODE-A-5040B TRAA-A-0161-04312
O-130		COUPLING, rigid: same as O-112	Attenuator power set shaft coupling		
O-130Ⓗ		COUPLING, rigid: same as O-112ⓅⒽ			
O-131	N16-S-21226-1224 Shop manufacture††	SUB-ASSEMBLY: shaft; consists of half hard brass, nickel pl shaft 0.187" diam max x 2.208" lg, o/a and nickel silver disc 0.064" thk x 0.750" diam w/0.129" hole 0.094" distance from edge; semi-circle 0.064" wide slot at a rad of 0.312" from ctr of disc, ends of slot rad	Drive eccentric for power set mechanism	ARC-13669 SZE-354-A-6287 TC-767A0029 TRAA-A-0161 04245	ARC-13669 SZE-354-A-6287 TC-767A0029 TRAA-A-0161-04245
O-131Ⓑ	R16MODE-A5075 2Z8203-711	SHAFT SUB-ASSEMBLY: consists of half hard brass, nickel pl shaft and disk; shaft 0.250" diam x 2.208 in. lg o/a with brass, nickel pl disk 0.064" thk x 0.745" diam w/0.129" hole 0.094" distance from edge; semicircle 0.066" wide slot at a rad of 0.250" from ctr of disk, ends of slot rad	Drive eccentric for power set mechanism	MODE-A-5075	MODE-A-5075
O-132Ⓨ	R16-C-15863	CASE: black bakelite; cylindrical shape; two-part, mating body and cap, 17/32" diam x 1-9/16" lg, having 3/16" overlap of body and cap	Container for spare thermistor	GE Part No. K8160791AA1	ARC-13705
O-132Ⓩ		CASE: c/o 17 S-T aluminum alloy, potash dip shell, ARC-15979; 1½" lg x 0.531" OD; external ½-27 NS-1 x 0.219" lg thd at open end; and 11 S-T aluminum alloy, potash dip cap, ARC-9808; 0.312" lg x 0.625" OD; internal ½-27 NS-1 thd; knurled for approx full outside lg	Container for spare thermistor	ARC-15980	ARC-15980
O-132Ⓗ	R16CEPL-1-2-2 N16-C-600401-104	VIAL: polystyrene; cylindrical shape, ½" diam x 2 lg with polyethylene cap	Container for spare thermistor	Celluplastic Corp ½ x 2 shld vial	SZE-354-A-6195

O-132⊙ ⊚	16-C-170001-442 Shop manufacture†† 6625-309-3934	CASE: cylindrical shape; two-part, mating body and cap; 17/32" diam x 1-9/16" lg, having 3/16" overlap of body and cap	Container for spare thermistor	TC-845A005 TRAA-A-0161-04041	TC-845A005 TRAA-A-0161-04041
O-132⊙	R16NEEN-NE949-12448	CASE: cylindrical shape; two-part, mating body and cap; polystyrene; ⅝" diam x 2⅛" lg	Container for spare thermistor	NEEN-12448	NEEN-12448
O-133	16-F200001-111 If required will be procured by nearest Navy Shore Supply Activity on demand††	SLEEVE, insulating: same as O-124	Insulator for Z-105		
O-133⊙	3F31559-3	ROD, spacing: 18-8SS; 3.715" lg x 0.1875" diam o/a; one end tapped 4-40 NC-2 full thd 3/16" d; other end 6-32 NC-2 male thd for 7/32" w/undercut to 0.094" 1/16" wd	Connects E-101 to O-102	MODE-A-5072B	MODE-A-5072B
O-134	16-R-651091-379 Shop manufacture††	CONE, bearing: steel SAE X-1314; 0.437" OD x 0.316" ID x 0.060" thk; 45 deg chamber, 0.020" wd	For A-106	ARC-10259 SZE-354-A-6336 TRAA-A-0161-04316	ARC-10259 SZE-354-A-6336 TRAA-A-0161-04316
O-134⊙	R16MODE-A-5209 2Z3590-7	RACE, BEARING: annular ball type; 0.625" OD; 0.500" ±.003" ID x 0.184" thk. Surface ground for use w/0.0625" dia ball bearings	For inner end of O-101	MODE-A-5209	MODE-A-5209
O-135	16-P-402301-124 Shop manufacture†† 3H250-21	BALL, bearing: SS type 440; 0.0625" spherical diam Rep/w G778999-75004-0100		ARC-8215 SZE-354-A-6335 MODE-A-5013 TRAA-A-0161-04317	ARC-8215 SZE-354-A-6335 MODE-A-5013 TRAA-A-0161-04317
O-136		COVER, resistor: phenolic; curved, 2¾" x 2-5/15" x 0.068" o/a; two 52S-¼H aluminum alloy posts, 5/16" diam x ¾" lg	For R-185	SZE-354-A-6215	SZE-354-A-6215 ARC-14872
O-136⊙⊚		See E-114⊙⊚			
O-137	R17P2950 N5820-604-0728	PLATE, locking: 52S-¼H aluminum alloy; irregular shape; 1.531" straight lg w/0.344" rad one end; 0.094" thk	Shaft lock	ARC-7198 SZE-354-B-6105 TRAA-A-0161-04301	ARC-7198 SZE-354-B-6105 TRAA-A-0161-04301
O-137⊙		See H-224⊙			
O-138		CLIP: phosphor bronze; 19/32" h; to hold 17/32" diam object	For O-132	ARC-13706 SZE-354-A-6038	ARC-13706 SZE-354-A-6038
O-138⊙ ⊚	R5920-177-1781-D336 N5940-258-1797	CLIP: p/o chassis assy A-104⊙⊚		LIT-127002	
O-139		CAM: 18-8SS cam, 7/16" diam x 11/16" lg w/0.312" lg grooved pin	Locking cams for shaft lock O-137	ARC-10953 SZE-354-A-6081	ARC-10953 SZE-354-A-6081
O-139⊙⊚		See H-225⊙⊚			
O-140⊙		LOCK, shaft: ½" h; ⅜-32 bushing; secured to 1¾" lg x 19/64" wd x 0.043" plate; modified from Millen Co. part #10060 by drilling shaft hole with size M drill to 23/64" d	Shaft lock	SZE-354-B-6058	SZE-354-B-6058
O-141		BALL, bearings: p/o E-152; SS type 400; 0.09375" spherical diam	For E-152	ARC-8107 SZE-354-A-6077	ARC-8107 SZE-354-A-6077

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
O-142		CRANK, hand: p/o E-152; c/o bushing and free-turning roller, both mtd on shaft; approx 1¾" lg x 13/16" o/v	For E-152	ARC-13785 SZE-354-A-6071	ARC-13785 SZE-354-A-6071
O-143⑧	16-F-200001-111	FERRULE: tapered 2 section; 17ST aluminum, etched; outer surface tapered 110 deg included; 0.303" thk, 0.204" ID, 0.500" OD on larger end decreasing with a taper of 110 deg included, separated at ctr line with 1/16" cutter	Secures cable	TC-805A0004	TC-805A0004
O-144⑧	16-R-651091-379	PLATE, retainer: tapered ID; 17ST aluminum, etched; round; 0.203" thk x 1.0" OD x 0.375" smaller ID x larger ID of 0.531" tapered down with 110 deg include; four 0.125" holes located 0.25" from horizontal and vertical lines	Retains O-143	TC-805A0005	TC-805A0005
O-145⑧	16P-402301-124	PLATE, end: round; 17ST aluminum etched; 0.125" thk x 1.0" ID x 0.25" OD; four 0.125" holes located 0.25" from horizontal and vertical center lines on 0.5 in. sq intake	Retains O-144	TC-805A0006	TC-805A0006
O-146⑫	N6625-604-0726	TRAY ASSY, switch: aluminum; 3-25/32" lg x 2-19/64" wd x 1⅜" h o/a; with four mounting posts 2.182" lg x ½" dia o/a	Container for switch S-101	TRAA-B-0161-04022	TRAA-B-0161-04022
R-101	3300-381166264 R16-R-17373-500 For replacement use N5905-192-0390 3RC20BF105J	RESISTOR, fixed: composition: 1,000,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	D-C return, sync input	RC20BG105J RC20GF105J⑫	JAN-R-11 MIL-R-11B⑫
R-102		RESISTOR, fixed; same as R-101	Grid return V-101A		
R-103	3300-381166140 R16-R-17309-48 For replacement use N5905-185-8510 3RC20BF103J	RESISTOR, fixed: composition; 10,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Cathode bias, V-101A	RC20BG103J RC20GF103J⑫	JAN-R-11 MIL-R-11B⑫
R-104	3300-381166200 R16-R-17344-179-550 For replacement use N5905-195-6761 3RC20BF104J	RESISTOR, fixed: composition; 100,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Plate load, V-101A	RC20BG104J RC20GF104J⑫	JAN-R-11 MIL-R-11B⑫
R-105		RESISTOR, fixed: same as R-101	Grid return, V-101B		

R-106	3300-381516140 R16-R-17310-17-500 N5905-185-8516 3RC42BF103J	RESISTOR, fixed: composition; 10,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Decoupling, V-101B	RC42BG103J RC42GF103J⑫	JAN-R-11 MIL-R-11B⑫
R-106⑧	N16-R-50282-171 For replacement use SNSN N16-R-50282-140	RESISTOR, fixed: composition; 10,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Decoupling, V-101	RC40BF103J	JAN-R-11
R-107		RESISTOR, fixed: same as R-106	Plate load, V-101B		
R-107⑧		RESISTOR, fixed: same as R-106⑧			
R-108	R16-R-17329-73-500 For replacement use N5905-239-0558 RC20BF433J	RESISTOR, fixed: composition; 43,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid return, V-102A	RC20BG433J RC20GF433J⑫	JAN-R-11 MIL-R-11B⑫
R-109① ⑧ ⑫	3300-381167180 R16-R-17347-145 For replacement use N5905-249-9468 3RC20BF134J	RESISTOR, fixed: composition; 130,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid return, V-102A	RC20BG134J RC20GF134J⑫	JAN-R-11 MIL-R-11B⑫
R-109④ ⑧	3300-381166680 N16-R-50659-431	RESISTOR, fixed: composition 120,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam; used in serial No. 899-1385; use R-109⑤ for all replacement	Grid return, V-102A	RC20BG124J	JAN-R-11
R-109⑤		RESISTOR, fixed: composition; 100,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid return, V-102A	RC20BG104J	JAN-R-11
R-110	3300-399812325 R16-P-5597-875 N16-R-88412-5151	RESISTOR, variable: composition 2.5 megohms ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round flatted metal shaft ¼" diam x ⅜" lg; B taper; contact arm-insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -32 NEF-2, ¼" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Rate Control	AB JB2552-P2040 RV4ATRD255F	ARC-8468 SZE-354-A-1008 JAN-R-94
R-110⑧	N16-R-88412-5253	RESISTOR, variable: composition; 2.5 megohms ±20%; 2 w; 3 solder lugs; metal case 1-3/16" diam x 21/32" d; enclosed; round metal shaft ¼" diam x ⅜" lg; A taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -32 NEF-2, ¼" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Rate control	AB31453 Alt JAN RV4ANRD255F	TC-125A0005 JAN-R-94
R-110⑨	3350-769500-7521 R16R88412-5264N 3Z7499-2E.33	RESISTOR, variable: same as R-110 except 1⅛" diam x ½" d o/a; w/¼" diam x 1⅛" lg shaft and ⅜" -32 NEF-2 x ⅜" lg bushing; one non-turn prong 17/32" from ctr	Rate control	CPH No. SY2374	NEEN-12420-1
R-110⑫		RESISTOR, variable: same as R-110 except for slotted shaft		RV4ATSD255F	MIL-R-94A

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-111		RESISTOR, fixed: same as R-104	Plate load, V-102A		
R-112	3300-381167860 R16-R-17350-500 For replacement use N5905-171-2003 3RC20BF204J	RESISTOR, fixed: composition; 200,000 ±5%; ½ w; 0.375" lg x 0.140" diam	Grid return, V-102B	RC20BG204J RC20GF204J⑫	JAN-R-11 MIL-R-11B⑫
R-113	3300-381518940 N5905-279-2675 16-R-50416-939 3RC42BF333J	RESISTOR, fixed: composition;- 33,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Plate load, V-102B	RC42BG333J RC42GF333J⑫	ARC-203(33,000) SZE-354-A-1017 JAN-R-11 MIL-R-11B⑫
R-113⑧	3300-381518940 N16-R-50417-171 For replacement use SNSN N16-R-50416-950††	RESISTOR, fixed: composition; 33,000 ohms —5%; 2 w; 0.688" lg x 0.312" diam	Plate load, V-102B	RC40BF333J	JAN-R-11
R-114	3300-381167120 R16-R-17310-58 For replacement use N5905-243-6821 3RC20BF153J	RESISTOR, fixed: composition; 15,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Differentiation load, V-103A	RC-20BG153J RC20GF153J⑫	JAN-R-11 MIL-R-11B⑫
R-115	R16-R-17326-300-500 For replacement use N5905-171-1998	RESISTOR, fixed: composition; 33,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Plate load cathode coupling, V-104A	RC20BG333J RC20GF333J⑫	JAN-R-11 MIL-R-11B⑫
R-116① ⑫	3300-381167060 R16-R-17268-13-100 For replacement use N5905-270-1757 3RC20BF152J	RESISTOR, fixed: composition; 1,500 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Cathode coupling, V-104	RC20BG152J RC20GF152J⑫	JAN-R-11 MIL-R-11B⑫
R-116②		RESISTOR, fixed: composition; 2,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Cathode coupling, V-104	RC20BG202J	JAN-R-11
R-117		RESISTOR, fixed: same as R-116① ⑫	Pulse delay limit, V-104B		

R-118	3300-399812068 R16-P-5595-190-350 N16-R-88342-2835	RESISTOR, variable: composition; 1 megohm ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round, flatted metal shaft ¼" diam x ⅜" lg; A taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -NEF-2, ¼" lg, two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Pulse delay control	AB-JA1052-P2040 RV4ATRD105D	ARC-8469 SZE-354-A-1009 JAN-R-94
R-118⑧	3300-399812068 N16-R-88342-5683	RESISTOR, variable: composition; 1 meg-ohm ±20%; 2 w; 3 solder lugs; metal case 1-3/32" diam x 21/32" d; enclosed; round metal shaft ¼" diam x ⅝" lg; B taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" NEF-2, ⅜" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Pulse delay control	AB31452 Alt JAN- RV4ANRD105D	TC-125A0004
R-118⑨	3350-795400-8955 R16R88342-5320N 2Z7273-74	RESISTOR, variable: same as R-118 except 1⅛" diam x ½ d o/a; w/¼" diam x 1⅛" lg round metal shaft and ⅜" -32 NEF-2 x ⅜" lg bushing and one non-turn prong 17/32" from ctr	Pulse delay control	CPH No. SY2375	NEEN-12420-2
R-118⑫	N5905-270-8003	RESISTOR, variable: same as R-118 except 10% tolerance		RV4ATRD105C	MIL-R-94A
R-119	3300-381517120 R16-R-17310-63-1 N16-R-50335-936 3RC42BF153J	RESISTOR, fixed: composition; 15,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Plate load, V-104B	RC42BG153J	JAN-R-11
R-119⑧ ⑫	3300-381517120 N16-R-50336-171 For replacement use N5905-171-1976	RESISTOR, fixed: composition; 15,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Plate load, V-104B	RC40BF153J RC42GF153J⑫	JAN-R-11 MIL-R-11B⑫
R-120		RESISTOR, fixed: same as R-104	Grid return, V-105		
R-121	3300-381169600 R16-R-17258-56-3 For replacement use N5905-252-4018 3RC20BF470J	RESISTOR, fixed: composition; 47 ohms ±5%; ½ w; 0.375 in. lg x 0.104" diam	Parasitic suppressor, V-105 screen	RC20BG470J RC20GF470J⑫	JAN-R-11 MIL-R-11B⑫
R-122	3300-381168100 R16-R-17310-171-3 For replacement use N5905-171-2004 3RC20BF223J	RESISTOR, fixed: composition; 22,000 ohms ±5%; ½ w; 0.375" lg x 0.104" diam	Cathode bias, V-105	RC20BG223J RC20GF223J⑫	JAN-R-11 MIL-R-11B⑫
R-123	R16-R-17264-56-17 For replacement use N5905-195-5571 3RC20BF681J	RESISTOR, fixed: composition; 680 ohms ±5%; ½ w; 0.375" lg x 0.104" diam	Cathode output load, V-105	RC20BG681J RC20GF681J⑫	JAN-R-11 MIL-R-11B⑫

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Tye*	*Cont. or Govt. Dwg. or Spec. No.*
R-124		RESISTOR, fixed: same as R-101	D-C return, external modulation receptacle, J-104		
R-125	3300-381167660 R16-R-17350-8-500 For replacement use N5905-192-0660 3RC20BF184J	RESISTOR, fixed: composition; 180,000 ohms ±5%; 0.375 in. lg x 0.140" diam	Grid return, V-106	RC20BG184J RC20GF184JⓃ	JAN-R-11 MIL-R-11BⓃ
R-126	3300-381317120 For replacement use N5905-299-2028 3RC30BF153J	RESISTOR, fixed: composition; 15,000 ohms ±5%; 1 w; 0.562" lg x 0.140" diam	Plate Load, V-106	RC30BG153J RC30GF153JⓃ	JAN-R-11 MIL-R-11BⓃ
R-127		RESISTOR, fixed: same as R-121	Parasitic suppressor, V-106 screen		
R-128	3300-381317180 R16-R-17349-8-100 For replacement use N5905-299-1999 3RC30BF154J	RESISTOR, fixed: composition; 150,000 ohms ±5%; 1 w; 0.562" lg x 0.225" diam	Screen dropping, V-107	RC30BG154J RC30GF154JⓃ	JAN-R-11 MIL-R-11BⓃ
R-129	3300-381166080 R16-R-17264-135-25 For replacement use N5905-195-6806 3RC20BF102J	RESISTOR, fixed: composition; 1,000 ohms ±5%; 1 w; 0.375" lg x 0.140" diam	Pulse width limit, V-107	RC20BG102J RC20GF102JⓃ	JAN-R-11 MIL-R-11BⓃ
R-130	3300-394387069 R16-P-5590-106 N16-R-88009-4552	RESISTOR, variable: composition; 100,000 ohms ±10%; 2 w; 3 solder lugs; metal case 1-1/16" dia x 19/32" d; enclosed; flatted, r;ound metal shaft ¼" diam x ⅜" lg; A taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushings ⅜" NEF-2, ¼" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Width control	AB-JA1041-P2040 AB-31454 RV4ATRD104C	ARC-8470 SZE-354-A-1010 TC-125A0003 JAN-R-94
R-130Ⓐ	3350-7945000-8326 R16R880009-4299N 3Z7480-269	RESISTOR, variable: same as R-130 except 1½" diam x ½" d o/a; with round metal shaft ¼" diam x 1⅛" lg and bushing ⅜" -32 NEF-2 x ⅜" lg and one non-turn prong 17/32" from center	Width control	CPH No. SY2376	NEEN-12420-3
R-130Ⓝ	N5905-666-2976	RESISTOR, variable: same as R130 except for slotted shaft		RV4NATSD104C	MIL-R-94A

R-131		RESISTOR, fixed: same as R-121	Parasitic suppressor, V-107 screen		
R-132		RESISTOR, fixed: composition; 33,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid bias divider, V-106	RC20BG333J	JAN-R-11
R-132Ⓑ		Not used			
R-133	3300-381517060 R16-R-17268-36 N5905-279-2530 R16JAN-RC42BF152J 3RC42BF152J	RESISTOR, fixed: composition; 1,500 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Plate load, V-107	RC42BG152J	JAN-R-11
R-133Ⓑ Ⓗ	N16-R-49966-926 For replacement use N5905-279-2530	RESISTOR, fixed: composition; 1,500 ohms ±5%; 2 w; 0.677" lg x 0.312" diam	Plate load, V-107	RC40BF152J RC42GF152JⒽ	JAN-R-11 MIL-R-11BⒽ
R-134		RESISTOR, fixed: same as R-133	Plate load, V-107		
R-134Ⓗ		RESISTOR, fixed: same as R-133ⒷⒽ			
R-135	R16-JAN-RC20BG154J For replacement use N5905-195-9483 3RC20BF154J	RESISTOR, fixed: composition; 150,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid return, V-108	RC20BG154J RC20GF154JⒽ	JAN-R-11 MIL-R-11BⒽ
R-136		RESISTOR, fixed: same as R-121	Parasitic suppr., V-108 screen		
R-137	3300-381318040 R16-R-17274-20-2 For replacement use N5905-279-1723 3RC30BF222J	RESISTOR, fixed: composition; 2,200 ohms ±5%; 1 w; 0.562" lg x 0.225" diam	Pulse transformer, T-101 load	RC30BG222J RC30GF222JⒽ	JAN-R-11 MIL-R-11BⒽ
R-138		RESISTOR, fixed: same as R-137	Pulse transformer, T-101 load		
R-139	3300-381318480 R16-R-17276-1-500 For replacement use N5905-279-3837 3RC30BF272J	RESISTOR, fixed: composition; 2,700 ohms ±5%; 1 w; 0.562" lg x 0.225" diam	Pulse transformer, T-101 load	RC30BG272J RC30GF272JⒽ	JAN-R-11 MIL-R-11BⒽ
R-140		RESISTOR, fixed: same as R-104	Grid return, V-109		
R-141		RESISTOR, fixed: same as R-121	Parasitic suppr., V-109 screen		
R-142		RESISTOR, fixed: same as R-122	Cathode bias, V-109		
R-143		RESISTOR, fixed: same as R-123	Cathode output load, V-109		
R-144		Not used			

CONTRACTS. See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-145	3300-394352503 R16-P-5581-320-500 N16-R-87352-5222	RESISTOR, variable: composition, 1,000 ohms ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round, flatted metal shaft ¼" diam x ⅞" lg; U taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -32 NEF-2, ¼" lg; two non-turn lugs located on 17/32" rad at 3 and 9 o'clock	Zero set control	AB-JU1022-FS2056 AB-31455 RV4ATFD102B	ARC-8185 SZE-354-A-1011 TC-125A0002 JAN-R-94
R-145Ⓐ Ⓑ	3350-793000-1794 3RV31039 For replacement use N5905-500-7588	RESISTOR, variable: same as R-145 except 1" lg shaft		RV4ATFE102B	MIL-R-94A
R-145Ⓑ		RESISTOR, variable: composition, 1500 ohms ±10%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; flatted metal shaft ¼" diam x ⅞" lg; U taper; contact arm insulated, no off position; shaft to withstand 1½" inch-ounces torque without rotating; bushing ⅜" -32 NEF-2, ¼" lg; two non-turn lugs located on 17/32" rad at 3 and 9 o'clock	Zero set control	AB-JU1521-FS2056	ARC-8692
R-146	3300-394362070 R16-P-5582-340 N16-R-87422-5210 3350-793000-1998 R16R87422-5725N 3RV32529	RESISTOR, variable: composition; 2,500 ohms ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round, slotted metal shaft ¼" diam x ⅜" lg; U taper; contact arm insulated, no off position; shaft to withstand ½ inch-ounce torque without rotating; bushing ⅜" -32 NEF-2, ½" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Meter zero adjustment control	AB-JLU2522-SD-4040L AB31456 RV4ATSA252B	ARC-8195 SZE-354-A-1012 TC-125A0006 JAN-R-94
R-146Ⓑ		RESISTOR, variable: same as R-146 except ⅞" lg shaft		RV4ATSD252B	MIL-R-94A

R-147	3300-391709070 N5905-173-8794 3350-516000-6595 R16MIL-RW31G302 3RW27202	RESISTOR, fixed: wire wound; 3,000 ohms ±5%; 7 w; 1½" lg x 7/16" OD x 5/16" ID; coated with black baking japan, resistant to salt water and high humidity; 2 solder lug term	Thermistor bridge, dropping	ARC-8173 RW31G302 NEEN-12419-1	ARC-8173 MIL-R-26B NEEN-12419-1
R-147Ⓑ	3300-391709070 N16-R-66158-4561	RESISTOR, fixed: wire wound; 3,000 ohms ±2%; 7 w; 1½" lg x 7/16" OD x 5/16" ID; coated with black baking japan, resistant to salt water and high humidity; 2 solder lug term	Thermistor bridge, dropping	TC-130A0001	TC-130A0001
R-148		RESISTOR, fixed: same as R-147	Thermistor bridge, dropping		
R-148Ⓑ		RESISTOR, fixed: same as R-147Ⓑ			
R-149	3300-381518055 R16-R-17274-31 N16-R-50012-126†† 3RC42BF222J	RESISTOR, fixed: composition; 2,200 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Reflector supply filter	RC42BG222J	JAN-R-11
R-149Ⓑ Ⓗ	3300-381518055 N16-R-50012-171 For replacement use N5905-192-0445	RESISTOR, fixed: composition; 2,200 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Reflector supply filter	RC40BF222J RC42GF222JⒽ	JAN-R-11 MIL-R-11BⒽ

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

R-150⑪ ⑫		RESISTOR, fixed: same as R-149⑧⑫			
R-151	3300-381170120 R16-R-17264-14-70 For replacement use N5905-195-6800 3RC20BF561J	RESISTOR, fixed: composition; 560 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Drift compensation, M-101	RC20BG561J RC20GF561J⑫	JAN-R-11 MIL-R-11B⑫
R-152	3300-381166560 R16-R-17261-126-500 For replacement use N5905-252-5434 3RC20BF121J	RESISTOR, fixed: composition; 120 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Drift compensation, M-101	RC20BG121J RC20GF121J⑫	JAN-R-11 MIL-R-11B⑫
R-153		RESISTOR, fixed: same as R-152	Thermistor bridge		
R-154		RESISTOR, fixed: same as R-152	Thermistor bridge		
R-155		RESISTOR, fixed: same as R-152	Thermistor bridge		
R-156	3300-381168300 R16-R-17262-55-96 For replacement use N5905-279-2593 3RC20BF241J	RESISTOR, fixed: composition; 240 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Sensitivity comp., M-101	RC20BG241J RC20GF241J⑫	JAN-R-11 MIL-R-11B⑫
R-157		RESISTOR, fixed: same as R-116	Sensitivity comp., M-101		
R-158	3300-381169780 R16-R-17331-64 For replacement use N5905-254-9201 3RC20BF473J	RESISTOR, fixed: composition; 47,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Reflector filter	RC20BG473J RC20GF473J⑫	JAN-R-11 MIL-R-11B⑫
R-159		RESISTOR, fixed: same as R-158	Reflector filter		
R-160	3300-390028389 R16-R-17259-40-900	RESISTOR, fixed: composition; 51 ohms ±5%; ½ w; characteristic F; ⅜" lg x 0.140" diam; uninsulated	Pickup loop termination	AB-EB5105	ARC-8478 SZE-354-A-1021
R-160⑪ ⑧ ⑫	3300-381169960 N5905-185-6731 3Z6005A1-23	RESISTOR, fixed: composition; 51 ohms +5%; ½ w; characteristic F; ⅜" lg x 0.140" diam; uninsulated	Pickup loop termination	RC20GF510J	MIL-R-11B
R-161		RESISTOR, fixed: same as R-147	Space heater		
R-161⑪		RESISTOR, fixed: same as R-147⑪			
R-162		RESISTOR, fixed: same as R-147	Space heater		
R-162⑪		RESISTOR, fixed: same as R-147⑪			

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-163	3300-381167540 R16-R-17262-28-44 For replacement use N5905-279-3514 3RC20BF181J	RESISTOR, fixed: composition; 180 ohms ±5%; ½ w; 0.375 in. lg x 0.140" diam	Shunt, I-101	RC20BG181J RC20GF181J⑫	JAN-R-11 MIL-R-11B⑫
R-164		RESISTOR, fixed: same as R-121	Parasitic suppr., V-114 screen		
R-165		RESISTOR, fixed: same as R-121	Parasitic suppr., V-114 grid		
R-166		RESISTOR, fixed: same as R-121	Parasitic suppr., V-115 screen		
R-167		RESISTOR, fixed: same as R-121	Parasitic suppr., V-115 grid		
R-168		RESISTOR, fixed: same as R-121	Parasitic suppr., V-116 screen		
R-169		RESISTOR, fixed: same as R-121	Parasitic suppr., V-116 grid		
R-170		RESISTOR, fixed: same as R-115	Plate load, V-121A		
R-171		RESISTOR, fixed: same as R-149	Reflector supply filter		
R-171⑧⑫		RESISTOR, fixed: same as R-149⑧⑫			
R-172	3300-381170620 R16-R-17339-5-50 For replacement use N5905-249-3661 3RC20BF683J	RESISTOR, fixed: composition; 68,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid bias divider, V-106 and V-108	RC20BG683J RC20GF683J⑫	JAN-R-11 MIL-R-11B⑫
R-172⑧		RESISTOR, fixed: same as R-158			
R-173①⑧⑫		RESISTOR, fixed: same as R-104	Grid bias divider, V-106 and V-108		
R-173⑧		RESISTOR, fixed: same as R-158			
R-174	3300-381168480 R16-R-17275-85-500 For replacement use N5905-279-1880 3RC20BF272J	RESISTOR, fixed: composition; 2,700 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Bias divider, V-102A	RC20BG272J RC20GF272J⑫	JAN-R-11 MIL-R-11B⑫

R-175		RESISTOR, fixed: same as R-103	Bias divider, V-103A		
R-176		RESISTOR, fixed: same as R-135	Bias divider, V-121		
R-177		RESISTOR, fixed: same as R-135	Bias divider, V-121		
R-178		RESISTOR, fixed: same as R-104	Bias divider, V-121		
R-178⑨		RESISTOR, fixed: composition, 110,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Bias divider, V-121	RC20BG114J	JAN-R-11
R-179	3300-399809030 R16-P-5588-13 N16-R-87852-5525	RESISTOR, variable: composition; 50,000 ohms ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round slotted metal shaft ¼" diam x ⅜" lg; U taper; contact arm insulated, no off position; shaft to withstand 1½ inch ounces torque without rotating; bushing ⅜" -32 NEF-2, ½" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Voltage adjust V-121 control	AB-JLU5032-SD4040L AB-31457 Alt. JAN-RV4ATSA503B	ARC-8187 SZE-354-A-1013 TC-125A0008 JAN-R-94
R-179⑧⑬	3350-793000-5515 R16R87852-5751N 3RV45046 N5905-502-7395	RESISTOR, variable: same as R-179 except ⅞" lg shaft		RV4ATSD503B	MIL-R-94A
R-180	3300-394384036 R16-P-5586-155 N16-R-87749-4560	RESISTOR, variable: composition; 25,000 ohms ±10%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round slotted and flatted metal shaft ¼" diam x ⅝" lg; U taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -32 NEF-2, ½" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	Low frequency reflector limit	AB-JLU2531 SD4040L AB-31458 Alt. JAN- RV4ATSA253A	ARC-8467 SZE-354-A-1014 TC-125A0007 JAN-R-94
R-180⑧⑬	3RV42533 N5905-255-2444	RESISTOR, variable: same as R-180 except ⅞" lg shaft		RV4ATSD253A	MIL-R-94A
R-181④ ⑤	3300-381518100 R16-R-17310-178-2 16-R-50372-126	RESISTOR, fixed: composition; 22,000 ohms ±5%; 2 w; 0.688" lg x 0.321" diam; use R-181⑥ for replacement in ④ only	Reflector voltage divider	RC42BG223J	JAN-R-11
R-181⑥	R16R17318-242	RESISTOR, fixed: composition; 27,000 ohms ±5%; 2 w; 0.688" lg x 0.312" diam	Reflector voltage divider	RC42BG273J	JAN-R-11
R-181⑧⑬	3300-381518100 N5905-239-0568	RESISTOR, fixed: composition; 22,000 ohms +5%; 2 w; 0.688" lg x 0.312" diam	Reflector voltage divider	RC40BG223J RC42GF223J⑬	JAN-R-11 MIL-R-11B⑬
R-182④ ⑤		RESISTOR, fixed: same as R-181④; use R-182⑥ for replacement in ④ only	Reflector voltage divider		
R-182⑥		RESISTOR, fixed: same as R-181⑥	Reflector voltage divider		
R-182⑧⑬		RESISTOR, fixed: same as R-181⑧⑬			
R-183		RESISTOR, fixed: same as R-181④	Reflector voltage divider		
R-183⑧⑬		RESISTOR, fixed: same as R-181⑧⑬			
R-184		RESISTOR, fixed: same as R-181④	Reflector voltage divider		
R-184⑧⑬		RESISTOR, fixed: same as R-181⑧⑬			

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-185	3300-380096020 R16-R-28359-900 N16-R-91908-2891 N16-R-91908-2896	RESISTOR, variable: wire wound, 200,000 ohms ±5%; 12 w; 3-3/16" diam max x 2⅜" thk	Reflector tracking voltage	GER Type 471-AS20MFP RA60A1RD204AJ TRAA-A-0161-04345	ARC-13838 SZE-354-B-1007 JAN-R-19 TRAA-A-0161-04345
R-185Ⓑ	R16MODE-B1900 3Z7498-20.37	RESISTOR, variable: wire wound, 200,000 ohms ±5%; 12 w; 2 term; 3" diam max x 2⅜" thk	Reflector tracking voltage	MODE-B-1900	MODE-B-1900
R-185A	N16-R-91908-3635	RESISTOR, variable: R-185 with cover O-136		ARC-No number SZE-354-B-1026	ARC-No number SZE-354-B-1026
R-185A Ⓑ	7CM3-ME-B-1901	RESISTOR ASSEMBLY: consists of RESISTOR R-185Ⓑ with insulator E-114 and mtg hardware	Reflector tracking voltage	MODE-B-1901	MODE-B-1901
R-186	3300-381168160 R16-R-17352-1-13 For replacement use N5905-192-0667 3RC20BF224J	RESISTOR, fixed: composition; 220,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Reflector compensation	SZE-354-B-1026 RC20BG224J RC20GF224JⒽ	SZE-354-B-1026 JAN-R-11 MIL-R-11BⒽ
R-187		RESISTOR, fixed: same as R-186	Reflector compensation		
R-188	3300-394384107 R16P5586-415 N16-R-87749-4780	RESISTOR, variable: composition; 25,000 ohms ±20%; 2 w; 3 solder lugs; metal case 1-1/16" diam x 19/32" d; enclosed; round flatted metal shaft ¼" diam x ½" lg; U taper; contact arm insulated, no off position; shaft to withstand 1½ inch-ounces torque without rotating; bushing ⅜" -NEF-2, ½" lg; two non-turn prongs located on 17/32" rad at 3 and 9 o'clock	High frequency reflector limit	AB-JU2532-FS2032 AB-31459 Alt. JAN-RV4ATFD253B	ARC-8302 SZE-354-A-1015 JAN-R-94 T⊃125A0009
R-188Ⓑ	3350-793000-28552 R16R87749-4097N 3Z7425-176	RESISTOR, variable: same as R-188 except 1⅛" diam x ½" d o/a; round metal shaft ¼" diam x 1⅜" lg; ⅜" -32 NEF-2 x ⅜" lg bushing, one non-turn prong 17/32"	High frequency reflector limit	CPH No. 5Y2382	N EEN-12450
R-188Ⓗ	N5905-255-2444	RESISTOR, variable; same as R-188 except for slotted shaft		RV4ATSD253B	MIL-R-94A
R-189		RESISTOR, fixed: same as R-121	Parasitic suppr., V-107 grid		
R-190		RESISTOR, fixed: same as R-149	Reflector supply filter		
R-190ⒷⒽ		RESISTOR, fixed: same as R-149ⒷⒽ			
R-191	3300-385255220 R16-R-18661 3350-516000-5875 R16JAN-RW31F152 3RW25300	RESISTOR, fixed: wire wound; 1,500 ohms ±5%; 10 w; 1½" lg x 7/16" diam; 2 term, 1⅛" apart x 13/32" high	Dropping thermistor	RW31G152 NEEN-12419-2	JAN-R-26 NEEN-12419-2

	N16-R-66074-2798	1½" lg x 7/16" diam; 2 term, 1⅛" apart x 13/32" high			
R-191⑪	N5905-264-8788	RESISTOR, fixed: same as R-191 except 1,400 ohms	Dropping thermistor	RW31G142	MIL-R-26B
R-192		RESISTOR, fixed: same as R-147	Space heater		
R-192⑧		RESISTOR, fixed: same as R-147⑧			
R-193		RESISTOR, fixed: same as R-149	Reflector supply filter		
R-193⑧⑬		RESISTOR, fixed: same as R-149⑧⑬			
R-194		RESISTOR, fixed: same as R-149	Reflector supply filter		
R-194⑧⑬		RESISTOR, fixed: same as R-149⑧⑬			
R-195	R16-R-17279-0-915 For replacement use N5905-279-3506 3RC20BF332J	RESISTOR, fixed: composition; 3,300 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Pulse voltage divider, external modulation input	RC20BG332J RC20GF332J⑬	JAN-R-11 MIL-R-11B⑬
R-196②		RESISTOR, fixed: same as R-132	Differential load, V-103B		
R-197	3300-381166680 R16JAN-RC20BG124J For replacement use N5905-182-3981 3RC20BF124J	RESISTOR, fixed: composition; 120,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Bias divider, V-105	RC20BG124J RC20GF124J⑬	JAN-R-11 MIL-R-11B⑬
R-198	3300-381170040 R16-R-17359-168 16-R-50839-431 For replacement use N5905-279-2516 3RC20BF514J	RESISTOR, fixed: composition; 510,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Decoupling, input amplifier V-101A	RC20BG514J RC20GF514J⑬	JAN-R-11 MIL-R-11B⑬
R-199		RESISTOR, fixed: same as R-158	Decoupling, input amplifier V-101A		
R-200		RESISTOR, fixed: same as R-104	Grid return, V-102A		
R-201		RESISTOR, fixed: same as R-101	Grid return, V-121B		
R-202		RESISTOR, fixed: same as R-121	Parasitic suppr. V-109 grid		
R-203① ⑨ ⑬		RESISTOR, fixed: same as R-104	Grid bias divider, V-106		
R-203②		RESISTOR, fixed: composition; 62,000 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Grid bias divider, V-106	RC20BG623J	JAN-R-11
R-204	R16JAN-RC20BG122J For replacement use N5905-190-8880 3RC20BF122J	RESISTOR, fixed: composition; 1,200 ohms ±5%; ½ w; 0.375" lg x 0.140" diam	Bias divider, V-102A	RC20BG122J RC20GF122J⑬	JAN-R-11 MIL-R-11B⑬

CONTRACTS. See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
R-205		RESISTOR, fixed: same as R-174	Grid isolation, V-108		
S-101ⓐ ⓑ ⓒ	3300-395499444 R17-S-25503 N5930-608-0658 3360-073114260 3Z9825-62.325	SWITCH, rotary: single pole 9 positions; 7 identical sect; solid silver alloy cont; ceramic insulation; treated w/ Dow Corning DC-200; 4¼" lg x 2-1/16" diam o/a; non-shorting contacts; solder lug term; single hole mtg ⅜" -32 NEF-2 bushing, ¼" lg; ¼" diam x ⅜" lg shaft	Selector switch	OAK Part No. 35500-DH7C or 49298-DH7C CN-12444 TRAA-B-0161-04304	ARC-12950 SZE-354-B-5014 TC-515B0003 NEEN-12442 TRAA-B-0161-04304
S-101ⓓ		SWITCH, rotary: same as S-101ⓐ except w/4 wire groups marked "D", "E", "F", and "G" to correspond with lettered bushings on wiring diagram fig. 7-3, 7-3A, and 7-3B	Selector switch	SZE-354-B-5068	SZE-354-B-5068
S-101Aⓔ	3Z9825-145	SWITCH, rotary: same as S-101 but wired ready to install	Selector switch	NEEN-14090	NEEN-14090
S-102	3300-395853200 R5930-187-3721-D334 N17-S-74139-4794 3Z9863-23N	SWITCH, toggle: DPDT; 3 amp, 250 v; rear lug type; 1-5/32" x 11/16" x 1¾" o/a; #15/32-32 facenut mtg; 6 rear term lugs; nickel pl lever; cad pl outside steel parts	A-c power switch	CUT Cat No. 8908K143 Alt. JAN-ST23N	ARC-8085 SZE-354-A-5009 JAN-S-23
T-101ⓐ ⓑ	3300-296949057 N17-T-80104-6155 3340-296949057 R16SLE-20471 2Z9627-278 3340-064051120	TRANSFORMER, pulse: inter-stage type; 40 to 4000 cps, ½ to 10 microseconds; primary DC resistance 4.6 ohms, sec DC resistance 25.4 ohms; 2000 vdc or peak AC 60 cyc insulation; hermetically sealed cad pl brass case; 2" lg x 1⅛" w x 1½" h, excluding term; synthetic resin base elec varnish impregnated and baked, "Oxite B" filled; 4 stud term located on cover, 1-3/16" x 1¼" ctr; 4 mtg inserts tapped #4-40 class 2 fit, ⅛" d, located on base of can, 1⅜" w x 1½" h, excluding term; synthetic resin base elec mary term "3" and "4" for sec term .	Modulator output	ARC-13791 TC-402B0001 SLE-20471	ARC-13791 TC-402B0001 NEEN-12445A
T-101ⓒ ⓓ	R5950-608-6245-E222 N5950-578-5717	TRANSFORMER, pulse: inter-stage type; 40 to 4000 cps, ½ to 10 microseconds; primary DC resistance 11.2 ohms, secondary DC resistance 25.4 ohms; 1500 volts RMS test hermetically sealed case mounted on 2" x 2" plate; four 4-40 tapped mtg holes on 1⅜" x 1½ in. ctr; four solder term mtd on top; cover stamped "1" and "2" for primary term, "3" and "4" for sec term, 2" wd x 2" dp x 1" h less term	Modulator output	SZE-354-C-3003 TRAA-B-0161-04335	SZE-354-C-3003 TRAA-B-0161-04335

T-102	3300-[illegible]35566 R16-T-6951-55 N5950-557-6821 3340-296935566 3340-06395-2030 R17T77901-5480N 5950-169-8312	TRANSFORMER, power: plate type; input 115v, 50 to 1600 cps, single ph; 2 primary windings connected in parallel, single CT sec winding; output 700-0-700v, 0.135 amp; insulation test, RMS 60 cps primary #1 to shield 1200 vact, shield to sec 3000 vact, shield #2 to primary #2 1200 vact; hermetically sealed metal case; approx 3½" lg x 3½" w x 4-3/32" h, excluding term; 5 stud-type term on bottom cover; 4 mtg inserts tapped #8-32 x 5/16" d located on 3" x 3" mtg/c w/bottom cover; stamped "1" and "2" at primary term, "3" and "4" and "5" at sec term on bottom	Power transformer	ARC-13647 SZE-354-C-3000 TC-401C0001 SLE-20445 TRAA-B-0161-04334	ARC-13647 SZE-354-C-3000 TC-401C0001 NEEN-12444A TRAA-B-0161-04334
T-103	3300-296935142 R16-T-6890-838 N5950-552-6822 3340-296935142 5950-295-7496 3340-063854790 R17-T-70710-4681N	TRANSFORMER, power: filament type; input 115v, 50 to 1600 cps, single ph; 2 primary windings connected in parallel, 4 secondary windings; secd #1 5v at 2 amp, secd #2 6.3v at 2.4 amp, secd #3 6.3v at 5.5 amp, secd #4 5.0v at 2.0 amp; insulation test, RMS 60 cps, primary #1 to gnd and primary #1 to shield #1 1200 vact, shield #1 to secd #1 2000 vact, secd #1 to gnd 2000 vact, secd #1 to secd #2 2500 vact, secd #2 to gnd 1500 vact, secd #2 to secd #3 2500 vact, secd #3 to gnd 2500 vact, serd #3 to secd #4 3000 vact, secd #4 to gnd and secd #3 to shield #2 1200 vact; paimary #2 to gnd 1200 vact; hermetically sealed metal case; approx 3½" w x 4-3/32" h, excluding term; ten stud type term on bottom cover, four mtg inserts tapped #8-32 x 5/16" d, on 3" x 3" mtg/c on bottom; synthetic resin base electrical varnish impregnated and baked, "Ozite" wax filled; stamped "1" through "10" at term on bottom.	Heater supply for electron tubes	ARC-13671 SZE-354-C-3001 SLE-20446 TC-400D0001 TRAA-B-0161-04332	ARC-13671 SZE-354-C-3001 NEEN-12443 TC-400D0001 TRAA-B-0161-04332
TH-101	3300-399730004 R16-T-2269 N5905-578-4987 3350-752000-5155 3Z6926-12.12	RESISTOR, thermal: 800 ohms 5% at 75° F (23.9°C); max power dissipation 1 w; designed for both AC and DC; disc shape, 0.400" diam x 0.113" thk; silver pl on both flat faces, resistance adjusted by removal of silver from central circular area, 3/16" diam max	Compensation, thermistor bridge drift	WE-D-172576 MODE-A-1002 VIEC-271D3⑫	ARC-11280 SZE-354-A-5027 TC-767A0034 MODE-A-1002
TH-102		RESISTOR, thermal: same as TH-101	Compensation, thermistor bridge sensitivity		
TH-103	3300-394186079 R16-T-2268 N5905-175-5449 R16-R-85056-1101N 5905-501-6090	RESISTOR, thermal: glass enclosed bead type; 2000 ohms at 25° C (77° F); 25 ma max cont AC or DC; 1" lg o/a; max bulb dimen 0.400" lg x 5/32" diam	Power monitor	WE-D-166382 VIEC-32A3	ARC-11295 TC-761A0008 SZE-354-A-5028
TH-104		RESISTOR, thermal: same as TH-103	Spare thermistor for TH-103		
TY-101●		ARRESTOR, electrical surge: resistor; silicon carbide; 1" lg x ¼" dia; term mtg by 2 wire lead term rated at 120 to 160v at 2 ma.	Surge limiter	GE Part No. K9802566G1	ARC-8505
TY-102●		ARRESTOR, electrical surge: same as TY-101●	Surge limiter		
V-101	3300-322864954 N5960-262-0219 3300-234890100 2J7F8	TUBE, electron: JAN type 7F8W; twin triode; replaces type 7F8 used previously	Input amplifier	7F8W	MIL-E-1B

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
V-101A	#	TUBE, electron; part of V-101; one triode section	Input amplifier		
V-101B	#	TUBE, electron; part of V-101; one triode section	Input amplifier		
V-102	#	TUBE, electron: same as V-101	Rate multivibrator		
V-102A	#	TUBE, electron: part of V-102; one triode section	Rate multivibrator combined w/V-101B		
V-102B		TUBE, electron: part of V-102; one triode section	Rate multivibrator combined w/V-102A		
V-103		TUBE, electron: same as V-101	Clipper, rate and delay		
V-103A		TUBE, electron: part of V-103; one triode section	Rate clipper		
V-103B		TUBE, electron: part of V-103; one triode section	Delay clipper		
V-104		TUBE, electron: same as V-101	Delay multivibrator		
V-104A		TUBE, electron: part of V-104; one triode section	Delay multivibrator combined with V-104B		
V-104B		TUBE, electron: part of V-104; one triode section	Delay multivibrator combined with V-104A		
V-105	3300-234800000 16-T-56759 N5960-166-9927 2J6V6GTY	TUBE, electron: JAN-6V6GTY; beam power amplifier	Undelayed sync output	JAN-6V6GTY 6V6GTY⑫	JAN-1A MIL-E-1B⑫
V-106		TUBE, electron: same as V-105	Width multivibrator, with V-107		
V-107		TUBE, electron: same as V-105	Width multivibrator, with V-106		
V-108		TUBE, electron: same as V-105	Pulse amplifier		
V-109		TUBE, electron: same as V-105	Delayed sync output		
V-110		TUBE, electron: same as V-101	Modulator clipper		
V-111	3300-234473500 16-T-56213-60 N5960-355-7269 2J6BM6A	TUBE, electron: type JAN-6BM6; reflex klystron; use type JAN-6BM6-A for replacement if available; refer to Note of paragraph 6.c., Section IV	R-f oscillator	JAN-6BM6A alt JAN-6BM6	JAN-1A

V-112	3300-23[redacted]00 16-T-55444 N5960-262-0148 2J5R4GY	TUBE, electron: JAN-5R4GY; dual diode	Rectifier, main supply	JAN-5R4GY 5R4WGA⑫	JAN-1A MIL-E-1B⑬
V-113		TUBE, electron: same as V-112	Rectifier, bias supply		
V-114		TUBE, electron: same as V-105	Electronic series losser		
V-115		TUBE, electron: same as V-105	Electronic series losser		
V-116		TUBE, electron: same as V-105	Electronic series losser		
V-117	3300-234005100 16-T-52001 N5960-262-0964 2J0A2	TUBE, electron: JAN-0A2; glow discharge	Voltage regulator, bias supply	JAN-0A2 OA2WA⑫	JAN-1A MIL-E-1B⑬
V-118		TUBE, electron: same as V-117	Voltage regulator, bias supply		
V-119		TUBE, electron: same as V-117	Voltage regulator, bias supply		
V-120		TUBE, electron: same as V-117	Voltage regulator, bias supply		
V-121		TUBE, electron: same as V-101	Electronic regulator control amplifier		
V-121A		TUBE, electron: part of V-121; one triode section	Electronic regulator control amplifier		
V-121B		TUBE, electron: part of V-121; one triode section	Electronic regulator control amplifier		
V-122		TUBE, electron: same as V-117	Voltage regulator, thermistor bridge		
W-105	3300-322864954 R16-P-6301* 17-L-63388-9901 For reference only†† N5905-578-4988	LINE, RF transmission: uses JAN cable RG-55/U; 23" lg excluding terminations; approx 24½" lg o/a; JAN UG-291/U connector one end; other end pick-up loop formed of half hard brass rod silver pl; 0.094" diam x 0.484" lg and resistor R-160	Attenuator cable	ARC-13792 SZE-354-C-5047 TC-768D0001 TRAA-C-0161-04176	ARC-13792 SZE-354-C-5047 TC-768D0001 TRAA-C-0161-04176
W-105⑧		LINE, RF transmission p/o O-107			
W-105A		LINE, RF transmission: p/o W-105; 23" lg JAN cable RG-55/U	Attenuator cable		
W-105B		LOOP, pickup: p/o W-105; ½" hard brass rod, silver pl; approx 0.094" diam x 0.484" lg	Pickup loop	ARC-13480 SZE-354-A-6323 TRAA-A-0161-04182	ARC-13480 SZE-354-A-6323 TRAA-A-0161-04182
W-105C	R6145-161-0904-E212 N6145-500-1230	CABLE, RF: 24½" lg, p/o W-105		RG-55/U	JAN-C-17A

*Not furnished as a maintenance part for BuShips activities personnel. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
X-101	3300-295956958 R16-S-6188-850 R16-S-6188-130 N5935-284-2309	SOCKET, tube: octal; retainer ring mtg; 1-11/64" diam chassis hole; round ceramic body 1¼" diam x 17/32" h, excluding term; phosphor bronze cad pl contacts, silicone treated	For V-101	ARC-12292 Ucinite-11505/C-152 EBY-9749-1⑫	ARC-12292 SZE-354-A-5013
X-101⑧	8850-839946 N16-S-63759-2633	SOCKET, tube: octal; retainer ring mtg; 1-11/64" diam chassis hole; round melamine body 1.251" diam x 0.352" diam x 0.352" h, excluding term; bronze silver pl contacts	For V-101	AMP 78-8L TM	TC-840A0001
X-102		SOCKET, tube: same as X-101	For V-102		
X-103		SOCKET, tube: same as X-101	For V-103		
X-104		SOCKET, tube: same as X-101	For V-104		
X-105	3300-295956957 R16-S-6188-170 N5935-201-3198	SOCKET, tube: octal; retainer ring mtg; 1-3/16" diam chassis mtg hole; round, micanol, 1¼" diam x 31/64" thk, excluding term; phosphor bronze silver pl contacts	For V-105	AMP Type 78-S8TAR AMP-78S8T TSB-8T101 EBY-9729-36⑫	ARC-6559 SZE-354-A-5017 JAN-S-28A
X-106		SOCKET, tube: same as X-105	For V-106		
X-107		SOCKET, tube: same as X-105	For V-107		
X-108		SOCKET, tube: same as X-105	For V-108		
X-109		SOCKET, tube: same as X-105	For V-109		
X-110		SOCKET, tube: same as X-101	For V-110		
X-111	R16-S-6148-20	SOCKET, tube: p/o H-106A (listed for reference only)	For V-111	ARC-13685 SZE-354-A-6311 AMP-78-54ST⑫	ARC-13685
X-112		SOCKET, tube: same as X-105	For V-112		
X-113		SOCKET, tube: same as X-105	For V-113		
X-114		SOCKET, tube: same as X-105	For V-114		
X-115		SOCKET, tube: same as X-105	For V-115		
X-116		SOCKET, tube: same as X-105	For V-116		
X-117	8850-884119 R16-S-6183-25 N16-S-62603-6700 R16-S-6151-51-500	SOCKET, tube: 7 contact miniature 45 deg spacing on 0.375" diam p a circle; cold rolled steel saddle, cad pl; two 0.120" diam mtg holes on 0.875" mtg/c; phosphor bronze cad pl contacts; round ceramic body 0.615" diam x 5/16" h w/shock shield and 0.095" ID center shield; o/a dimen approx 1-3/32" lg x 1¼" h x 51/64" w	For V-117	EBY Type 8328	ARC-11581 SZE-354-A-5005

X-117Ⓡ	8850-882870 N16-S-62603-6676	SOCKET, tube: 7 contact miniature 45 deg spacing on 0.375" diam pin circle; cold rolled steel saddle, cad pl; two 0.125" diam mtg holes on 0.875" mtg/c; phosphor bronze cad pl contacts; round ceramic body 0.615 in. diam x 5/16" h w/shock shield and 0.095" ID center shield; o/a dimen approx 1-3/32" lg x 51/64" w x 1¼" h	For V-117	TSE7T102	JAN-S-28A
X-117Ⓡ Ⓔ	2Z8677.99 N5935-259-1944	SOCKET, tube 7 contact miniature; same as X-117Ⓡ	For V-117	TS102C01	JAN-S-28A
X-118		SOCKET, tube: same as X-117	For V-118		
X-119		SOCKET, tube: same as X-117	For V-119		
X-120		SOCKET, tube: same as X-117	For V-120		
X-121		SOCKET, tube: same as X-101	For V-121		
X-122		SOCKET, tube: same as X-117	For V-122		
X-123	N5920-156-9233 R5920-156-9223-D336 8870-556000-365 5920-539-7771	HOLDER, fuse: extractor post type; for single type 3AG cartridge fuse; approx 2⅜" lg x ¾" diam o/a; ½" -24 threaded body for ½" diam panel hole mtg; 2 solder term lugs; cap engraved "FUSE" with arrow indicating direction to turn to remove cap	For F-101	BUS Type HKP BUS Type HKP-H	ARC-8170 SZE-354-A-5015
X-123Ⓡ	8800-619703	HOLDER, fuse: extractor post type; for single type 3AG cartridge fuse; approx 2-7/64" lg x 11/16" diam o/a; ½" -24 threaded body for ½" diam panel hole mtg; 2 solder term lugs; cap engraved "FUSE" with arrow indicating direction to turn to remove cap	For F-101	BUS HKM	TC-847A0001
X-124		HOLDER, fuse: same as X-123	For F-102		
X-125		HOLDER, fuse: same as X-123	For F-103		
X-126		HOLDER, fuse: same as X-123	For F-104		
X-127	R17-L-12932-128-20 N17-L-76737-2771 7700-547855	SOCKET, lamp: indicator; space heaters	For I-101	Dial Light Co. of America No. DV-90-H-SAO, frosted colorless lens	ARC-13655 SZE-354-A-5008 TC-650A0001
X-127A		SOCKET, lamp: indicator; p/o X-127; for T-3¼ miniature bayonet lamp; 1/16" lg; 11/16" x 27 NC2 thd; supplied w/fibre washer, lockwasher and locking nut; 1⅛" lg x 19/32" diam body; two 11/32" lg lug term	For I-101		SZE-354-A-5052
X-127B		LENS, indicator: p/o X-127; red lens fitted w/dimming turn device; mkd "DIM" and "BRIGHT" w/arrows; 15/16" lg x 13/16" max diam	For I-101		SZE-354-A-5051-2

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
X-128	R17-L-12932-128-25 N17-L-76865-6306 7700-548455	SOCKET, lamp: indicator; 6v input	For I-102	Dial Light Co. of America No. DV-90-H-SAO, red lens	ARC-11383 SZE-354-A-5037 TC-650A0002
X-128A		SOCKET, lamp; indicator; p/o X-128; same as X-127A	For I-102		
X-128B		LENS, indicator; p/o X-128; same as X-127B except white lens	For I-102		SZE-354-A-5051-1
XF-101⑩		HOLDER, fuse: same as X-123	For F-101		
XF-102⑩		HOLDER, fuse: same as X-124	For F-102		
XF-103⑩		HOLDER, fuse: same as X-125	For F-103		
XF-104⑩		HOLDER, fuse: same as X-126	For F-104		
XF-123⑨⑫		HOLDER, fuse: same as X-123	For F-101		
XF-124⑨⑫		HOLDER, fuse: same as X-123	For F-102		
XF-125⑨⑫		HOLDER, fuse: same as X-123	For F-103		
XF-126⑨⑫		HOLDER, fuse: same as X-123	For F-104		
XI-101⑨	7700-549000 R17L12930-230 2Z5991-489	LIGHT, indicator: w/white frosted lens, panel mtd in 11-16" diam mtg hole; 125v 15w rating; 2¼" lg x ⅞" diam o/a black nickel finish	For I-101	DLC-202210-125	NEEN-12433
XI-101⑩		SOCKET, lamp: same as X-127	For I-101		
XI-101⑫	R6210-519-1136-D336 N6210-553-7439 6210-538-9578	LIGHT, indicator: w/plain clear convex lens	For I-101	LH62BC2	MIL-L-3661
XI-101A⑨	2Z5991-496	LIGHT, indicator: w/o lens, p/o XI-101⑨	Holds XI-101B⑨	DLC-2210	NEEN-14366
XI-101A⑩		SOCKET, lamp: same as X-127A, except p/o XI-101⑩	For I-101		
XI-101A⑫	N6210-233-5321	LAMPHOLDER, miniature: bayonet base	For I-101	DLC-81410-1	
XI-101B⑨	2Z6125-390	LENS: white frosted, 15/16" lg x 13/16" diam o/a; mtd in brass black nickel plate holder	For XI-101	DLC-20-125	
XI-101B⑩		LENS, indicator: same as X-127B, except p/o XI-101⑩	For I-101		
XI-101B⑫	R6210-299-2706-D336 N6210-243-0056 6210-188-8773	LENS, indicator: white frosted back	For I-101	DLC-81-117	

XI-102⑨	7700-548670 R17L11690-5 2Z5991-490	LIGHT, indicator: same as XI-101 except red frosted lens	For I-102	DLC-202210-121	NEEN-12434
XI-102⑩		SOCKET, lamp: same as X-128	For I-102		
XI-102⑫	N6625-295-2925 6210-519-1486	LIGHT, indicator: w/plain red convex lens	For I-102	LH62BR2	MIL-L-3661
XI-102A⑨		LIGHT, indicator: same as XI-101A⑨	Holds XI-102B⑨		
XI-102A⑩		SOCKET, lamp: same as X-128A, except p/o XI-102⑩	For I-102		
XI-102A⑫		LAMPHOLDER, miniature: same as XI-101A⑫	For I-102		
XI-102B ⑨		LENS: red frosted, 15/16" lg x 13/16" diam o/a mtd in brass black nickel plate holder p/o X1-102⑨	For XI-102⑨	DLC-20-121	
XI-102B ⑩		LENS, indicator: same as X-128B, except p/o XI-102⑩	For I-102		
XI-102B ⑫	R6210-247-1778-D336 N6210-299-3010	LENS, indicator: red frosted back	For I-102	DLC-81-111	
XV-101⑩		SOCKET, tube: same as X-101	For V-101		
XV-102⑩		SOCKET, tube: same as X-102	For V-102		
XV-103⑩		SOCKET, tube: same as X-103	For V-103		
XV-104⑩		SOCKET, tube: same as X-104	For V-104		
XV-105⑩		SOCKET, tube: same as X-105	For V-105		
XV-106⑩		SOCKET, tube: same as X-106	For V-106		
XV-107⑩		SOCKET, tube: same as X-107	For V-107		
XV-108⑩		SOCKET, tube: same as X-108	For V-108		
XV-109⑩		SOCKET, tube: same as X-109	For V-109		
XV-110⑩		SOCKET, tube: same as X-110	For V-110		
XV-111⑩		SOCKET, tube: same as X-111	For V-111		

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6-4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
XV-112[illegible]		SOCKET, tube: same as X-112	For V-112		
XV-113[illegible]		SOCKET, tube: same as X-113	For V-113		
XV-114[illegible]		SOCKET, tube: same as X-114	For V-114		
XV-115[illegible]		SOCKET, tube: same as X-115	For V-115		
XV-116[illegible]		SOCKET, tube: same as X-116	For V-116		
XV-117[illegible]		SOCKET, tube: same as X-117	For V-117		
XV-118[illegible]		SOCKET, tube: same as X-118	For V-118		
XV-119[illegible]		SOCKET, tube: same as X-119	For V-119		
XV-120[illegible]		SOCKET, tube: same as X-120	For V-120		
XV-121[illegible]		SOCKET, tube: same as X-121	For V-121		
XV-122[illegible]		SOCKET, tube: same as X-122	For V-122		
Y-101① [illegible] [illegible]	3300-291703109 R16-ARC-13664 17-C-77624-1307 R16MODE-A7012 2Z5091-45 If failure occurs requisition a replacement part from ESO, referencing NavShips 900,180A as authority††	SUB-ASSEMBLY: forms the inner conductor of coaxial cavity; p/o cavity sub-assembly A-106; c/o contacting ring and tubular conductor; brass tubing and tobin bronze ring, silver pl; cylindrical; approx 15/16" diam x 3½" lg; use Y-101② for replacement (listed for reference only for Contracts N383s-60879 and N383s-61060)	Cavity center conductor and fingers	ARC-13664 SZE-354-A-6288 MODE-A-7012 TRAA-A-0161-04285	ARC-13664 SZE-354-A-6288 TC-762A0038 TRAA-A-0161-04285

Y-101⑨	3300-291703109 R16-ARC-13664	SUB-ASSEMBLY: forms the inner conductor of coaxial cavity; p/o cavity sub-assembly A-106; contacting ring and tubular conductor; brass tubing and tobin bronze ring, gold pl; cylindrical; approx 15/16" diam x 3½" lg	Cavity center conductor and fingers	ARC-13664	ARC-13664
Y-101A	†	Part of Y-101			
Y-101B	†	Part of Y-101			
Y-102① ⑨ ⑫	3300-291703108 R16-ARC-13752 16-H-800001-279 If failure occurs, requisition a replacement part from ESO, referencing NavShips 900,180A as authority†† R16MODE-B5193	SHELL, tuned cavity: forms body of tuned cavity; p/o cavity sub-assembly A-106; c/o a cylindrical cavity shell, contacting ring, and mtg bracket; body and bracket of brass, contacting ring of beryllium copper, all silver pl; approx 9⅜" lg x 1⅞" wd x 4" h o/a; mtd by two #6-32 tapped inserts on 1½" mtg/c on mtg bracket; use Y-102② for replacement; (listed for reference only for Contract No. N383s-60879 and N383s-61060)	Cavity barrel	ARC-13752 SZE-354-B-6249 TC-762B0002 MODE-B-5193 TRAA-B-0161-04279	ARC-13752 SZE-354-B-6289 TC-762B0002 MODE-B-5193 TRAA-B-0161-04279
Y-102②		SHELL, tuned cavity: same as Y-102① except gold plated		ARC-13752	ARC-13752
Y-103	† 16-T-25301-1360* If required, will be procured by nearest Navy Shore Supply Activity on demand††	CONDUCTOR: resonant line, half hard brass; 2.656" lg x 0.124" diam one end, other end 0.187" sq x 0.250" h, 0.078" wd x 0.078" d slot across square end, 0.0625" diam hole one side of slot, #2-56 NC-2 other side of slot #2-56 NC-1 tapped 3/16" d full thread in 0.124" diam end	Center conductor for resonant pickup line of attenuator tee	ARC-13538 SZE-354-A-6290 TC-767A0024 TRAA-A-0161-04223	ARC-13538 SZE-354-A-6290 TC-767A0024 TRAA-A-0161-04223
Y-103⑨	ZZ10008-173	CONDUCTOR: resonant line: c/o half hard brass rod, silver pl, 0.122" diam x 2.656" lg, each end tapped 3/16" deep w/2-56 NC-2 thd; conductor yoke, half hard brass, silver pl, 5/32" lg, slotted one end; and r-f pick up bottom; half hard brass, silver plate, 0.156 inches long and 0.250" diam	Center conductor and pick-up for resonant pick-up line of attenuator tee	MODE-A-5207	MODE-A-5207
Y-104		Not used			
Y-104A	†	APERTURE: p/o attenuator sub-assembly A-107	Couples r-f to thermistor loop		
Y-104B	†	APERTURE: p/o attenuator sub-assembly A-107	Couples r-f to attenuator loop		
Y-105	† For reference only††	TUBE: thermistor; half hard brass; 1.281" lg x 0.750" diam max; threaded one end ¾" -20 NEF-1 for 0.187" full thread; other end turned to 0.623" diam for 0.203" (listed for reference only)	Thermistor tube for attenuator tee	ARC-13342 SZE-354-A-6291	ARC-13342 SZE-354-A-6291
Y-106⑨⑫		TUBE: thermistor, structural p/o A-113⑨⑫		TRAA-A-0161-04199	TRAA-A-0161-04199

*Not furnished as a maintenance part for BuShips activities personnel. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6–4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U (Less accessories)

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
Y-106	† For reference only††	TUBE: attenuator; hard brass tubing; 5.875" lg x 0.625" OD x 0.500" ID; chamfered at one end internal 45 deg x 0.031"; held to 0.623" diam ±0.001" at this end for 15/16"; held at other end to 0.623" diam ±0.001" for ¼"; (listed for reference only for Contract No. N383s-60879 and N383s-61060)	Attenuator tube for attenuator tee	SZE-354-A-6292 ARC-13476	SZE-354-A-6292 ARC-13476
Y-106⑨⑫		TUBE: attenuator, structural part of A-113⑨⑫		TRAA-A-0161-04196	TRAA-A-0161-04196
Z-101④ ⑨ ⑫	3300-308417990 R16-C-27620-60 N5999-569-0050 R16MODE-A7006A 5999-569-0050	CHOKE: coaxial choke assembly; p/o socket assembly H-106; silver pl brass shell enclosing 3 high-frequency iron cores through which passes a brass term rod which is slotted lengthwise to permit its expansion to ID of core, term rod and core insulated from shell; one end of term rod threaded for #6-32 NC-2 nut, which secures assembly, the ends of the term rod forming stud-type term; 1500 vdct, 750 vdcw; cylindrical shape; approx 9/16" diam x 2-7/32" lg o/a, ½" diam body; shell externally threaded ½" -48 NS-1 for 3/16" of its lg beginning 3/16" from one end, to mate with female thread in socket assembly, shell turned with integral 3/16" w straight knurled ring above thd to provide finger grip for insertion and removal of choke; use Z-101⑤ for all replacement	Focusing grid r-f filter, V-111	SZE-354-A-5048 ARC-11240 TC-762A0008 MODE-A-7006A TRAA-A-0161-04260	SZE-354-A-5048 ARC-11240 TC-762A0008 MODE-A-7006A TRAA-A-0161-04260
Z-101⑤		CHOKE: same as Z-101④ except for characteristics of high frequency iron cores; used beginning with serial No. 1321 of referenced contract		ARC-16271	ARC-16271
Z-102④⑫		CHOKE: same as Z-101④⑫	Cathode r-f filter, V-111		
Z-102⑤		CHOKE: same as Z-101⑤			
Z-103④⑫		CHOKE: same as Z-101④⑫	Heater r-f filter, V-111		
Z-103⑤		CHOKE: same as Z-101⑤			

Z-104	3300-308417991 R5915-608-8967-E212 N5820-604-0739 7CM3-ME-A-7018 R16MODE-A7018 5999-502-1142	CHOKE: coaxial choke assembly; p/o cavity subassembly A-106; silver plated brass shell enclosing four high-frequency iron cores, each 0.375" OD x 0.144" ID x 0.500" lg, through which passes a concentric conductor consisting of three resistors, JAN type RC20BG102J, series connected, one end of this resistor combination connected to a stud type terminal, the other end connected to a banana type male connector; core and concentric conductor insulated from shell; 2000 vdct, 1000 vdcw, 3000 ohms ±10% DC resistance; cylindrical shape; 0.494" diam body with integrally turned mtg ring ⅝" diam x 0.094" wd approx 9/16" from end of shell, approx 3⅛" lg o/a; plugs into cavity sub-assembly A-106, being retained therein by means of ⅞" -27 thumb nut H-101 which bears on mtg ring and engages male thread on cavity sub-assembly A-106	R-f filter reflector	ARC-13768 SZE-354-A-5049 TC-762A0097 MODE-A-7018 TRAA-A-0161-04266	ARC-13768 SZE-354-A-5049 TC-762A0097 MODE-A-7018 TRAA-A-0161-04266
Z-105	3300-308417992 R6625-512-9975-E222 N6625-512-9975 3340-060081630 R16MODE-A7054 3C1084Z63-2	CHOKE: coaxial choke assembly; p/o cavity assembly A-105; c/o silver plated brass shell enclosing three high-frequency iron cores, each 0.375" OD x 0.173" ID x 0.500" lg, through which passes a concentric conductor consisting of two insulated choke coils, inductance of each choke coil, approx 3 uh, series connected, one end of this choke combination connected to a stud-type terminal, the other end to a contact; concentric conductor insulated from core and shell; 300 vdct, 50 vdcw; cylindrical shape; ½" diam body with integrally turned mtg ring 0.680" diam x 0.062" w, approx 1/16" from end of shell, approx 2⅛" lg o/a; plugs into cavity assembly A-105, being retained by means of a ¾" -20 thumb nut H-108, which bears on mtg ring and engages male thread on cavity assembly A-105	R-f filter for TH-103	ARC-13827 SZE-354-A-5050 TC-761B0091 MODE-A-7054 TRAA-A-0161-04148	ARC-13827 SZE-354-A-5050 TC-761B0091 MODE-A-7054 TRAA-A-0161-04148
Z-106	†	CHOKE, coaxial: 4 RF high frequency iron cores; silver plated brass case; part of attenuator assembly A-107; 0.375" diam x 0.250" lg core	Klystron power set shaft r-f choke		

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U accessories

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
A-108⑦		CASE: equipment carrying; wood-aluminum sandwich; empty; 21-1/16" wd x 13½" d x 16½" h, o/a; shock-mount pads for equipment; one external folding handle on each end; 10 trunk-type fasteners for securing cover to case; includes aluminum accessory case secured to cover, accessory case cover hinged and locked by two slide fasteners, approx 10⅛" lg x 7⅛" wd x 1⅜" h	For Signal Generator TS-419/U	CY-686/U	ARC-13102
A-108⑤⑥	R16-AN-CY-686A/U N16-C-170001-316	CASE: equipment carrying; wood-aluminum sandwich; empty; 20-1/16" wd x 13½" d x 16½" h, o/a; shock-mount pads for equipment; one recessed folding handle on each end; 6 trunk-type fasteners for securing cover to case; includes aluminum accessory case secured to cover, accessory case cover hinged and locked by two slide fasteners, approx 10⅛" lg x 7⅛" wd x 1⅜" h	For Signal Generator TS-419/U	CY-686A/U	ARC-15892 SZE-354-C-6182
A-108⑧	16-C-170001-451 Shop Manufacturer‡	CASE: equipment carrying; wood-aluminum sandwich; empty; 20" lg x 13-7/16" wd x 16½" h, o/a; shock mount pads for equipment; one folding handle on each end; six draw bolts fastening case to cover; includes accessory components cases secured to cover, accessory case cover, hinged and locked by two slide fasteners, approx 10⅛" lg x 7⅛" wd x 1-3/16" h	For Signal Generator TS-419/U	SKY 124-01/B CY-686/U	
A-108⑨		CASE: equipment carrying: same as A-108⑧ except 20¾" lg x 13½" wd x 16¾" h o/a; accessory case cover 10⅞" lg x 8⅛" wd x 1¼" h	For Signal Generator TS-419A/U	CY-686C/U	TRAA-D-0161-04002
E-166	R5935-201-2874-E212 N5935-149-3914	ADAPTER, connector: three supplied; Type BNC; male one end, Type UHF #49190 or equivalent, female other end; straight; used to adapt BNC connector to UHF connector; approx 1¼" lg x ½" diam	Adapt BNC connector to UHF connector	UG-255/U	BuShips Dwg RE49F378
E-167		ADAPTER: same as E-166	Adapt BNC connector to UHF connector		
E-168		ADAPTER: same as E-166	Adapt BNC connector to UHF connector		
E-169	R5935-171-3022-E212 N5935-258-1763 5935-201-3090	ADAPTER, connector: three supplied: Type N, male one end, Type BNC female other end; straight; used to adapt BNC connector to N connector: approx 1-1/16" lg x ¾" diam	Adapt BNC connector to N connector	UG-201/U	BuShips Dwg RE49F335

E-170		Adapter: same as E-169	Adapt BNC connector to N connector		
E-171		Adapter: same as E-169	Adapt BNC connector to N connector		
E-172	3300-298296948 R5935-149-3534-E212 N5935-149-3534 5935-511-6489	ADAPTER, connector: type UHF #49194 or equivalent male one end. Type BNC female other end; straight; used to adapt UHF connector to BNC connector; approx 1⅜" lg x ¾" diam	Adapt UHF connector to BNC connector	UG-273/U	BuShips Dwg RE49F389
E-173		ADAPTER: same as E-172	Adapt UHF connector to BNC connector		
E-174		ADAPTER: same as E-172	Adapt UHF connector to BNC connector		
F-105⑦	N17-F-16302-120 8800-361212	FUSE, cartridge: 3 amp; one time; glass body; ferrule term, ¼" diam x 1-7/32" lg o/a; term ¼" diam x ¼" lg type 3AG	Spare	BUS-3AG LIT-312003	ARC-3484 TC-860A0015
F-105⑧	R17-F-16310 N5920-281-0209	FUSE, cartridge; three supplied; 3 amp; one time; glass body; ferrule term; ¼" diam x 1-7/32" lg o/a; term ¼" diam x ¼" lg, type AGC3	Spare	BUS-AGC3	ARC-8587 SZE-354-A-5016
F-105⑨		FUSE, cartridge: same as F-105⑧, except five supplied		F02G3R00A⑲	MIL-F-15160C⑲
F-106		FUSE: same as F-105⑧	Spare		
F-107		FUSE: same as F-105⑧	Spare		
I-103	8800-444163 G17-L-6297 G6240-155-8706	LAMP, incandescent: three supplied; 6-8 v, 0.15 amp; bulb T3¼ clear; 1-3/16" lg max o/a; miniature bayonet base; tungsten filament; burn any position	Spare	GE Type 47	ARC-11349 SZE-354-A-5033 TC-860A0016
I-104		LAMP, incandescent: same as I-103	Spare		TC-804A0090
I-105		LAMP, incandescent: same as I-103	Spare		
N-103⑲		PLATE, identification: aluminum, anodized; 3" lg x 1" w x 0.031" thick o/a; four 0.125" diam holes on 1¾" x 2¾" mtg centers	CY-686C/U nameplate	TRAA-A-0161-04321	TRAA-A-0161-04321
W-101	R16-C-3824 N17-C-48226-1020	CABLE ASSEMBLY, power: portable installation; two #16 AWG stranded conductors, individual conductors insulated w/1/32" wall of free-stripping rubber compound, one colored black, one white; conductors twisted with cotton fillers and covered w/black 60% rubber compound jacket; round, 0.330" diam o/a; one end w/straight plug connector w/two parallel rectangular female contacts, Hubbell 7057, approx 1⅜" diam x 1½" lg o/a; other end fitted w/straight plug connector w/two flat parallel blades, Hubbell 7084, approx 1½" diam x 1⅞" lg o/a; approx 6' lg o/a	Input power cable	CX-337/U(6'0")	ARC-14701 SZE-354-B-5011 TC-804A0090
W-101⑲		CABLE ASSEMBLY, power: consisting of three No. 18 AWG conductors MIL type CO-03MGF (3/18)0330; one identification marker; one UP121M connector with spade lug; one AN3106A-10SL-3S plug with cable clamp AN3057-4	Input power cable	CX-3135/U (6' 0")	TRAA-A-0161-04007
W-101A	R17-P-4455	CONNECTOR, plug p/o W 101; two parallel rectangular female contacts		HAW 7084	SZE-354-A-5002
W-101A ⑲	N5935-549-6306	CONNECTOR, plug: p/o W-101⑲; three female contacts	Mates power input receptacle J-106	AN3106A-10SL-3S	MIL-C-5015B
W-101B		CABLE, power: p/o W-101; primary power; two #16 AWG stranded conductors; rubber insulated cond		USR #749 Type SJO	SZE-354-A-5012

CONTRACTS See paragraphs 1 and 2 in section VI for applicable contracts.

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TABLE 6—4. TABLE OF REPLACEABLE PARTS (Cont.)

MODEL: SIGNAL GENERATOR AN/URM-64 **MAJOR ASSEMBLY:** SIGNAL GENERATOR TS-419/U accessories

Reference Designation	*Stock Number(s)*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or JAN Type*	*Cont. or Govt. Dwg. or Spec. No.*
W-101B Ⓑ		CABLE, power: p/o W-101Ⓑ; primary power; three No. 18 AWG stranded conductors; rubber insulated cond		CO-03MFG (3/18)0330	MIL-C-3432A
W-101C	R17-P-4457	CONNECTOR, plug: p/o W-101; two parallel rectangular male contacts		HAW 7057	SZE-354-A-5001
W-101C Ⓑ	R5935-666-2621-DANN N5935-636-7145	CONNECTOR, plug: p/o W-101Ⓑ; two parallel rectangular fixed contacts with one reversible grounding blade	Input power plug	UP121M	MIL-C-3767
W-101D Ⓑ	N5935-248-2375	CLAMP, cable: used on connector W-101AⒷ	Cable clamp	AN3057-4	MIL-C-5015B
W-101E Ⓑ	R5940-518-6956-D336	TERMINAL, lug: spade type; copper, hot tinned; 0.138" x 9/16" lg	Grounding lug	ZE-193	
W-102	R16-C-3738-700 N16-C-11923-8221 Assemble from component parts‡	LINE, RF transmission: JAN transmission line CG-546/U; uses JAN cable RG-55/U; 6′ lg excluding terminations; approx 6′2" o/a lg; JAN UG-88/U connector each end	R-f cable	CG-546/U(6′0")	ARC-13780 SZE-354-B-5041 TRAA-A-0161-04003
W-102A	N5935-258-4422	CONNECTOR, plug: p/o W-102		UG-88/U	MIL-C-3608
W-102B	R6145-161-0904-E212 N6145-500-1236 6145-161-0904	CABLE, RF: p/o W-102		RG-55/U	JAN-C-17A
W-102C		CONNECTOR, plug: same as W-102A			
W-103	R16-C-3761 N16-C-11945-2218 Assemble from component parts‡	LINE, RF transmission: JAN transmission line CG-409/U; uses JAN cable RG-58/U; 8′ lg excluding terminations; approx 8′2" o/a lg, JAN UG-88/U connector each end	Video cable	CG-409/U(8′0")	ARC-11369 SZE-354-B-5042
W-103Ⓑ		LINE, RF transmission: same as W-103 except uses JAN cable RG-58A/U		CG-409A/U(8′2")	TRAA-A-0161-04005
W-103A		CONNECTOR, plug: same as W-102A, p/o W-103			
W-103B		CABLE, RF: p/o W-103		RG-58/U	
W-103B Ⓑ	R6145-161-0904-E212 N6145-500-1236 6145-161-0904	CABLE, RF: p/o W-103Ⓑ		RG-58A/U	JAN-C-17A
W-103C		CONNECTOR, plug: same as W-102A, p/o W-103			
W-104		LINE, RF transmission; same as W-103	Video cable		
W-104Ⓑ		LINE, RF transmission; same as W-103Ⓑ	Video cable		
W-104A		CONNECTOR, plug: same as W-102A, p/o W-104			
W-104B		CABLE, RF: same as W-103B, p/o W-104			
W-104C		CONNECTOR, plug: same as W-102A, p/o W-104			
	CR41-W-2462 42-W-2460-3	WRENCH: Bristo set screw; alloy steel; four-spline drive; L-shaped; approx 1¾" lg	For Bristo #6 set screw	Bristol #6	ARC-8220 SZE-354-A-6059 TC-860A0014

SECTION VII

DRAWINGS

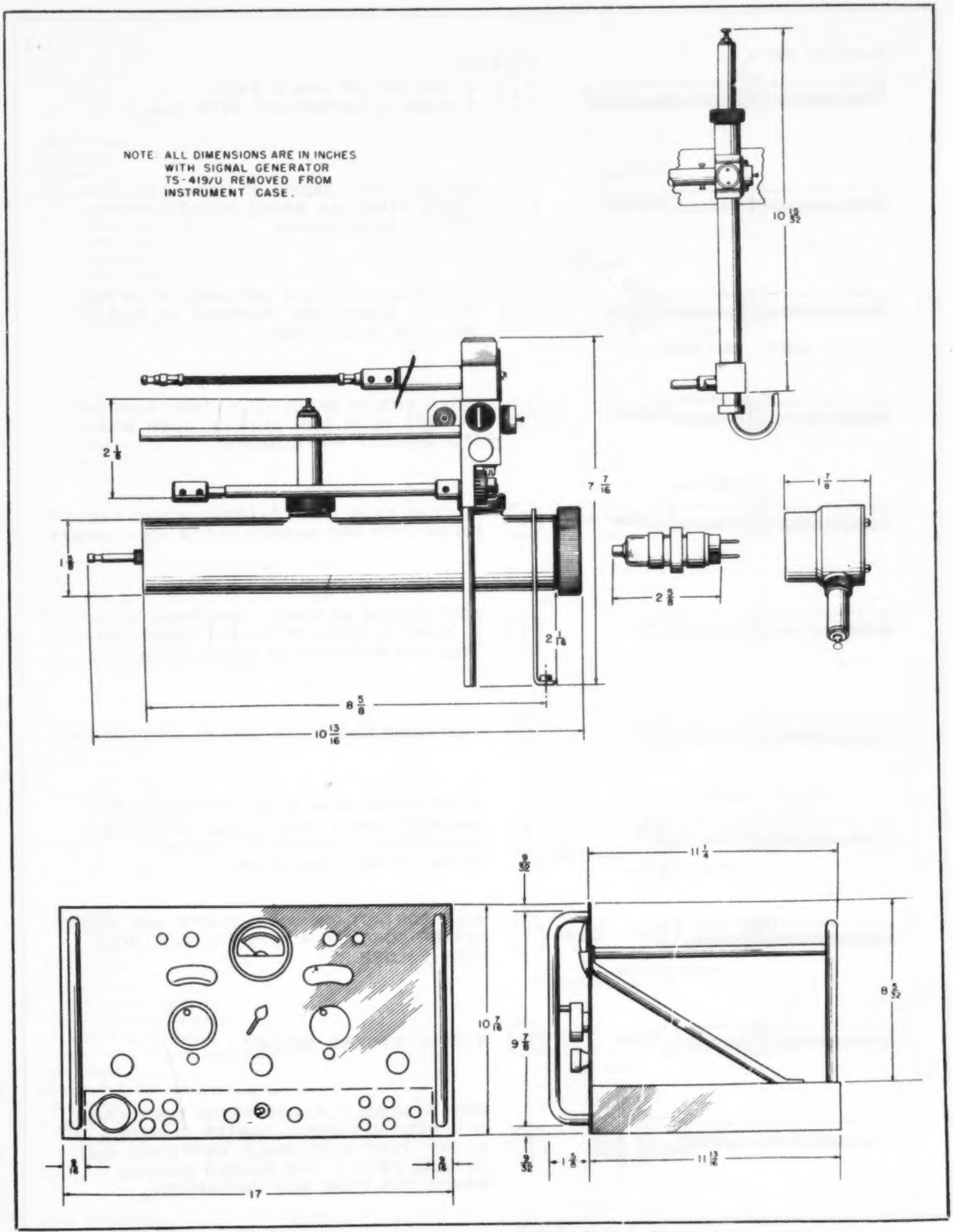
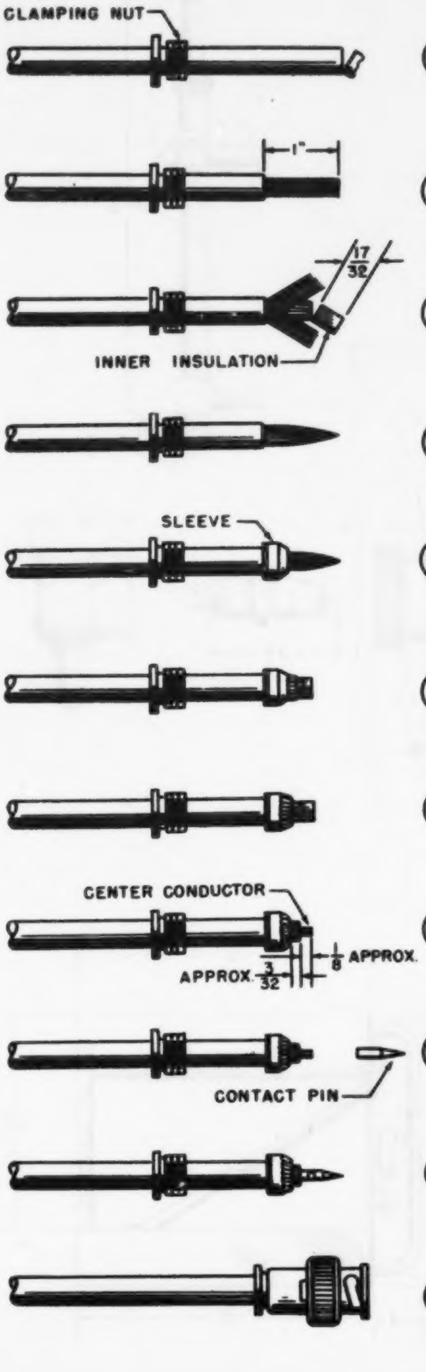

NOTE: ALL DIMENSIONS ARE IN INCHES WITH SIGNAL GENERATOR TS-419/U REMOVED FROM INSTRUMENT CASE.
10 15/32
7 7/16
2 1/8
1 5/8
2 1/16
8 5/8
10 13/16
1 7/8
2 5/8
11 1/4
9/32
8 5/32
10 7/16
9 7/8
9/16
9/16
17
9/32
1 5/8
11 13/16

Figure 7-8. Signal Generator TS-419/U, Outline Dimensions



① A-CUT END OF CABLE EVEN
B-SLIDE CLAMPING NUT OVER CABLE.

② CUT OFF VINYL JACKET 1" FROM END OF CABLE EXPOSING BRAID, BEING CAREFUL NOT TO NICK BRAID.

③ FAN BRAID OUT. CUT OFF INSULATION AND CENTER CONDUCTOR (PURPOSE OF THIS IS TO LEAVE SHARP END.)

④ TAPER END OF BRAID (AS SHOWN). PURPOSE OF THIS IS TO SLIP SLEEVE OVER BRAID AND AGAINST VINYL JACKET.

⑤ SLIDE SLEEVE OVER TAPERED BRAID AND FORCE OVER AND AGAINST OUTER VINYL JACKET.

⑥ WITH SLEEVE IN PLACE, TRIM BRAID APPROX. $\frac{1}{8}$" NOTE: IF CABLE IS DOUBLE BRAID SHIELDED TRIM OFF OUTER BRAID CLOSE TO SLEEVE.

⑦ FOLD BRAID BACK OVER SLEEVE AND SMOOTH.

⑧ A-CUT INNER INSULATION APPROX. TO $\frac{3}{32}$"
B-REMOVE INNER INSULATION. CUT CENTER CONDUCTOR TO INDICATED DIMENSION.
C-TIN CENTER CONDUCTOR.

⑨ HOLD CONTACT PIN WITH PLIERS AND INSERT CENTER CONDUCTOR INTO PIN. FILL HOLE WITH SOLDER.

⑩ REMOVE EXCESS SOLDER.

⑪ BODY ASSEMBLY (ILLUSTRATED). SLIDE CABLE INTO BODY ASSEMBLY, TIGHTEN CLAMPING NUT. DO NOT TURN BODY WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE PLUG NON-WATERPROOF.

Figure 7-9. Attaching UG-88/U Connector to RG-55/U or RG-58/U Cable

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For explanation of abbreviations used, see AR 320-50.

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